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VOLUME CXVII.

HANDBOOK
OF
GEOGRAPHICAL AND HISTORICAL
PATHOLOGY.

BY
DR. AUGUST HIRSCH,
PROFESSOR OF MEDICINE IN THE UNIVERSITY OF BERLIN.

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GEOGRAPHICAL AND HISTORICAL PATHOLOGY.

CHAPTER I.

BRONCHIAL CATARRH.

§ 1. GEOGRAPHICAL DISTRIBUTION.

CATARRHAL diseases of the organs of respiration, including both the chronic and the acute forms and such after-effects as bronchiectasis, emphysema and asthma, hold a foremost place in the statistics of sickness from most parts of the globe. Although more frequent in some regions than in others, they are nowhere so low in the list of maladies of general prevalence as not to be reckoned in all countries among the commonest of complaints. A numerical expression for their frequency in various parts of the world is certainly not to be had; in order to form an estimate of them we have to depend upon general expressions such as "frequent" or "rare," which observers and the compilers of returns mostly resort to. At the same time we may conclude from these expressions, such as they are, that the larger number of catarrhal attacks belong undoubtedly to the temperate and higher latitudes, that it is not so much the geographical position as the climatic and weather-conditions that determine the more or less frequent occurrence of the malady, and that in a very large number of equatorial

and sub-tropical regions where the same conditions obtain, catarrhal troubles of the organs of respiration figure prominently in the returns of sickness not less than in higher latitudes.

In the Eastern Hemisphere, one of the principal regions of respiratory catarrh is formed by the group of countries to the extreme North, including *Iceland*,¹ the *Farøe Islands*,² the coasts and mountain districts of the *Scandinavian peninsula*³ (in Falun, for example, the cases of bronchitis from 1854 to 1866 were 21.1 per cent. of the total sickness)⁴ and the northern parts of *Russia-in-Europe* and *Russia-in-Asia*.⁵

Catarrh of the respiratory organs is met with on a large scale in all parts of the *British Islands*, in *North Germany*, in *Holland* and *Belgium*, both on the plains and in the mountainous districts, as well as in *Switzerland* and *France*. Whether, as some of the accounts from Germany and France would lead us to believe, the interior plains of Central Europe are a good deal more free from these maladies than the countries just mentioned, is a point that we cannot decide, owing to the want of statistical data in any degree serviceable for the purpose. In *Italy*, as Parola⁶ explicitly says, catarrhal conditions of the breathing organs count among the "malattie communissime"; and we learn from the accounts relating to many places both on the mainland⁷ and in the

¹ Schleisner, 'Island undersøgt fra et lægevidenskabel synspunkt,' Kjöbenh., 1849, p. 3.

² Manicus, 'Bibl. for Læger,' 1824, p. 15; Panum, *ibid.*, 1847, April, p. 279.

³ Harmand, 'Medicina Lapponum,' Lond., Goth., 1734; Halland, 'Abhandl. der Schwed. Akad.,' xxxvi, 64; Huss, 'Om Sverges endem. sjukd.,' Stockh., 1852, 22.

⁴ Hallin, 'Sv. Läk. Sällsk. nya Handl.,' ser. ii, Deel ii, 234.

⁵ See the accounts by Bluhin, 'Versuch einer Beschr. der in Russl. herrschenden Krankheiten,' Marburg, 1790, p. 237 (for the Baltic Provinces); Attenhofer, 'Med. Topogr. von St. Petersburg,' Zürich, 1817, p. 235; Bardowsky, 'Med. Ztg. Russl.,' 1850, No. 20 (for Novgorod); Jonin, *ib.*, 1849, No. 25 (for Viatka); Gebler, 'Annal. der Hlkt.,' 1813, p. 330; Rex, 'Med. Ztg. Russl.,' 1859, p. 408; Maurin, 'Arch. de méd. nav.,' 1877, Aug., p. 84 (for Siberia); Bogonodsky, 'Med. Ztg. Russl.,' 1854, No. 1 (for Kamschatka).

⁶ 'Saggio di climatologia e di geogr. nosoc. dell' Italia,' Torino, 1881, 569; see also Guislain, 'Lettre méd. sur l'Italie,' Gand, 1840, 24.

⁷ See the accounts by Menis, 'Topogr. stat.-med. della provincia di Brescia,' Bresc., 1837, 127; Cerioli, 'Annal. univ. di med.,' 1820, Genn. 11 for Cremona; Hildenbrand, 'Annal. schol. clin. Ticin.,' Pav., 1826, i, 119, for Pavia; Savio,

islands of *Sicily*,¹ *Corsica*,² and *Sardinia*,³ that they occur in widest distribution equally in the coast districts, on the inland plains, and among the mountains. The same is true of many parts of the *Iberian peninsula*, whence we have more precise information for the plateaus of New Castile and Estremadura,⁴ the mountain districts of Galicia, the Asturias and Navarra,⁵ the coast districts of Portugal,⁶ and the provinces of Southern Spain.⁷ There is evidence also for Greece⁸ and Turkey.⁹

In Nearer Asia, the chief regions of catarrh are the table-land of *Armenia*,¹⁰ the mountainous parts of *Syria*,¹¹ the central plateau of *Arabia*,¹² and the table-land of *Persia*.¹³ From *India*, we hear that catarrhs of the respiratory organs are somewhat rare in Lower Bengal;¹⁴ while they are more com-

'Sulla topogr. fisico-med. del Siccomario,' Pav., 1846, for the district of Siccomario; Valentin, 'Voyage méd. en Italie,' Nancy, 1822, 141, for Milan; Briard, 'Trav. de la soc. de méd. de Dijon,' 1842, 120, for the shores of the Adriatic; Taussig, 'Venedig von Seiten seiner klimat. Verhältnisse,' Vened., 1847, 68; Salvagnoli, 'Saggio illustr. le tavole delle statistica med. delle Maremme,' Firenze, 1845, ii, 44, for the Tuscan Maremma; Guislain, l. c.; Valentin, l. c. 59; Carrière, 'Le climat de l'Italie,' &c., Par., 1840, for Rome; Mammi, 'Filiatr. Sebez.,' 1842, Nov., for Reggio; de Renzi, 'Topogr. e statist. med. della città di Napoli,' &c., Nap., 1845, 320, for Naples.

¹ Irvine, 'Observ. upon Diseases . . . in Sicily,' Lond., 1810.

² Vanucci, 'Bull. de l'Acad. de Méd.,' 1838, Mai 29.

³ Moris in De la Marmora, 'Voyage en Sardaigne,' &c., Par., 1826.

⁴ Thierry, 'Observ. de physique et de Méd.,' Par., 1791, i, 259, ii, 9; Faure, 'Souvenirs du Midi,' &c., 74.

⁵ Guthrie, 'Lond. Med. and Phys. Journ.,' 1830, lxiv, 187.

⁶ Wallace, 'Edinb. Med. and Surg. Journ.,' 1829, Jan., 76; Brandt in Dobell's Reports, 1870, i, 388.

⁷ Martinez, 'Topogr. med. de la ciudad de Malaga,' Malaga, 1852; Gregory, 'Lond. Med. Gaz.,' 1828, June, for Gibraltar.

⁸ Landerer, 'Arch. der Pharmacie,' 1851, Nov.; Valassopoulos, 'Congrès des médecins Grecs,' &c., Constantinople, 1883, 23.

⁹ Rigler, 'Die Türkei,' &c., ii, 227; Sandwith, 'Assoc. Med. Journ.,' 1854, 434, for the northern provinces.

¹⁰ Wagner, 'Reise nach dem Arrarat,' Stuttg., 1848.

¹¹ Pruner, 'Krankh. des Orients,' 283; Tobler, 'Beitr. zur med. Topogr. von Jerusalem,' Berl., 1855, 36; Robertson, 'Edinb. Med. and Surg. Journ.,' 1843, April, 247, speaks of the extreme rarity of catarrhal affections of the respiratory organs in the coast districts of Syria; in like manner Post, 'New York Med. Record,' 1868, June, 149, with reference to Beyrout.

¹² Pruner, l. c., Palgrave, 'Union méd.,' 1866, N. 20, 308.

¹³ Polack, 'Wien. med. Wochenschr.,' 1853, N. 14.

¹⁴ Geddes, 'Clin. Illustr. of the Diseases of India,' Lond., 1846, 285; Gordon, 'Med. Times and Gaz.,' 1856, Aug., 188.

mon in the North-West Provinces,¹ in Sind² and at various places on the eastern and western seaboard;³ becoming especially frequent in the mountainous parts of the country—on the slopes of the Himalaya,⁴ the table-land of Chota-Nagpore,⁵ Mount Abu,⁶ the Nilghiri Hills,⁷ and the Eastern and Western Ghâts.⁸ Not less common are these maladies in many parts of *Ceylon*,⁹ the islands of the *Malay Archipelago*,¹⁰ the coast of Tenasserim (*Lower India*¹¹), and *Cochin China*.¹² On the other hand Murchison¹³ and Dawson¹⁴ are agreed in saying that they occur but seldom on the plains of Burmah; and the statement is confirmed in the fact given by Stewart¹⁵ that there were during one year only 65 cases of lung-disease of every kind among 1088 British troops stationed in Pegu, a proportion of 60 per 1000 men, and one of the smallest percentages of lung-complaint in the whole British army.

¹ Webb, 'Pathol. Ind.,' Lond., 1848, 100 d.; Evans, 'Edinb. Med. Journ.,' 1855, July.

² Don, 'Transact. of the Bombay Med. Soc.,' 1840, iii, 10.

³ Huillet, 'Arch. de méd. nav.,' 1868; Fér and Follet, ib., 1880, April, p. 299, for Pondicherry; Day, 'Madras Quart. Journ. of Med. Sc.,' 1861, April, p. 320, for Cochin.

⁴ Webb, l. c., p. 100.

⁵ Dunbar, 'India Journ. of Med. and Phys. Sc.,' n. s. i, 443.

⁶ Lowndes, 'Trans. Bombay Med. Soc.,' 1857, n. s., iii, 176.

⁷ Young, 'Trans. Calcutta Med. Soc.,' iv, 36; Mackay, 'Madras Quart. Journ. of Med. Sc.,' 1861, July, p. 26.

⁸ Eyre, ib., 1860, Oct., p. 322; Hunter, 'Trans. Bombay Med. Soc.,' 1839, ii, 32.

⁹ Marshall, 'Notes on the Med. Topogr. of the Interior of Ceylon,' Lond., 1822.

¹⁰ For Java, Heymann, 'Krank. der Tropenländer,' p. 158; and Lesson, 'Voyage méd. autour du monde,' Paris, 1829, p. 97; for the Molluccas, Lesson, l. c., and van Hattem, 'Nederl. Tijdschr. voor Geneesk.,' 1858, ii, 538; also ref. in 'Arch. de méd. nav.,' 1870, Mars, p. 175 (for Ternate); ib., 1869, Sept., p. 176 (mountainous parts of Amboina); van Leent, ib., 1877, Févr., p. 81 (coast of the Lampong country in Sumatra and Manilla in the Philippines); ib., 1872, Jan. (Borneo); de Meijer, 'Nederl. Tijdschr. voor Geneesk.,' 1859, iii, 327; and another authority in 'Arch. de méd. nav.,' 1873, Juin, p. 412 (Riouw-Lingga Archipelago); Steen-Bille, 'Bericht von der Reise der Corvette "Galatea" um die Welt,' Leipz., 1852, i, 244 (Nicobars).

¹¹ Ward and Grant, 'Official Papers on the Med. Topogr. of Malacca,' Penang, 1830.

¹² Richaud, 'Arch. de méd. nav.,' Mai, p. 352; Beaufls, ib., 1882, April, p. 262.

¹³ 'Edin. Med. and Surg. Journ.,' 1850, April, p. 248.

¹⁴ 'Philad. Med. Examiner,' 1853, May.

¹⁵ 'Indian Annals of Med. Sc.,' 1854, April, p. 432.

Nearly all observers refer to the common occurrence of respiratory catarrhs on the southern and south-eastern coasts of *China*,¹ and the facts are the same for *Japan*,² the *Australian Colonies*,³ including *Tasmania*,⁴ and for *New Zealand*, in which latter, according to Thomson,⁵ the annual death-rate among the Maoris is 169 per 1000, acute and chronic bronchitis being the next most important factors therein after consumption. As regards *Polynesia*,⁶ we have particulars to the same effect from New Caledonia and the New Hebrides,⁷ the Fiji Islands,⁸ the Tongan⁹ and Samoan¹⁰ groups, Tahiti,¹¹ the Marquesas,¹² the Hawaiian Islands,¹³ and the Gilbert (or Kingsmill) Islands.¹⁴

A noteworthy exemption from all kinds of affections of the breathing organs, catarrh among the rest, is enjoyed by *Egypt*, according to the unanimous testimony of observers.¹⁵

¹ Wilson, 'Med. Notes on China,' Lond., 1846, p. 50; Hobson, 'Med. Times and Gaz.,' 1860, Nov., p. 478; Armand, 'Gaz. méd. de Paris,' 1861, p. 201; Smart, 'Trans. Epid. Soc.,' 1862, i, 223; Friedel, 'Beitr. zur Kenntniss des Klimas und der Krankh. Ost-Asiens,' Berl., 1863, pp. 62, 87; Laure, 'Hist. méd. de la marine française pendant les expéditions de Chine et de Cochinchine,' Paris, 1864, p. 22.

² Wernich, 'Geogr. med. Studien,' Berl., 1878, p. 174; Godet, 'Étude sur l'hygiène au Japon,' Paris, 1880, p. 54.

³ Lesson, l. c., p. 112; Clutterbuck, 'Port Phillip in 1849,' Lond., 1850; Richardson, 'Edin. Med. Journ.,' 1869, March, p. 202; Bourse, 'Arch. de méd. nav.,' 1876, Janv.

⁴ Dempster, 'Trans. Calcutta Med. Soc.,' vii, 357.

⁵ 'Brit. and For. Med.-Chir. Rev.,' 1854, Oct.; see also Tuke, 'Edin. Med. Journ.,' 1863, Sept., p. 220.

⁶ Brunet, 'La Race Polynésienne,' Paris, 1876.

⁷ Vinson, 'Topogr. méd. de la Nouvelle-Calédonie,' Paris, 1858; Boyer, 'Arch. de méd. nav.,' 1878, Sept., p. 325; de Rochas, 'Essai sur la topogr. hyg. et méd. de la Nouvelle-Calédonie,' Paris, 1860, p. 17; Charlopin, 'Notes rec. en Calédonie, &c.,' Montpell., 1868, p. 16.

⁸ Ref. in 'Arch. de méd. nav.,' 1866, Janv.; Messer, ib., 1876, Nov., p. 321.

⁹ Wilkes, 'Narrative of the United States Exploring Expedition,' Philad., 1845, iii, 32.

¹⁰ Turner, 'Glasgow Med. Journ.,' 1870, Aug., p. 502.

¹¹ Ref. in 'Arch. de méd. nav.,' 1865, Oct., 228.

¹² Ref. ib., 297; Clavel, ib., 1884, Août, 149.

¹³ Chapin, 'Amer. Journ. of Med. Sc.,' 1837, May, 43; Gulick, 'New York Journ. of Med.,' 1855, March.

¹⁴ Wilkes, l. c., v, 104.

¹⁵ Pruner, l. c.; Barclay, 'Edin. Med. and Surg. Journ.,' 1854, Oct., 656; Griesinger, 'Arch. für phys. Hlkde.,' 1853, xii, 547; Vauvray, 'Arch. de méd.

On the other hand respiratory catarrhs are common on the coast and interior table-land of *Abyssinia*,¹ in *Nubia*, in the hill-country of *Kordofan*, and in other parts of the *Soudan*.² There is the same contrast as regards these catarrhs, between the *Zanzibar*¹⁰ coast, where they are comparatively rare, and the *Mozambique coast*,³ the Comoro Islands (*Mayotte*),⁴ *Madagascar*,⁵ *Nossi-Bé*,⁶ the *Seychelles*,⁷ *Réunion*,⁸ and *Mauritius*,⁹ in all of which they are common. On *St. Helena*, again, they would appear to be rare, inasmuch as, according to the 'Army Medical Reports,' only 150 cases were treated for bronchitis in a total force of 4550 men during the period 1860-1868, or 33 per 1000. In the interior of *South Africa*,¹¹ as well as at the *Cape*,¹² respiratory catarrhs are among the most frequently observed maladies; and the same holds good absolutely, and more particularly in the case of natives and acclimatized Europeans, for the *West Coast of Africa*,¹³ the *West African Islands* of San

nav., 1873, Sept., 161; Pissas, 'Congrès des médecins Grecs,' &c., Constantinople, 1883, 17.

¹ Pruner, l. c.; Aubert-Roche, 'Annal. d'hyg.,' xxxiii, 21; Courbon, 'Observ. topogr. et méd.,' &c., Par., 1861, 31; Blanc, 'Gaz. hebdomad.,' 1874, Nr. 21, 333.

² Quintin, 'Extrait d'un voyage dans le Soudan,' Par., 1869, 37 (his account relates to Ségu-Sicorro on the right bank of the Niger, in lat. 13° 32' N.).

³ 'Arch. de méd. nav.,' 1868, Mars, 181.

⁴ Grenet, 'Souvenirs méd. de quatre années à Mayotte,' Montp., 1866.

⁵ Borchgrevink, 'Norsk Magaz. for Laegevidensk.,' 1872, 234.

⁶ Guiol, 'Arch. de méd. nav.,' 1822, Nov., 329.

⁷ Allan, 'Edinb. Monthly Journ. of Med.,' 1821, Aug., 560.

⁸ Dutroulau, 'Traité des malad. des Européens dans les pays chauds,' Par., 1861, 51.

⁹ Couzier, 'Journ. de méd.,' vii, 406; Lesson, 'Voyage méd. autour du monde,' 143: "Peu de contrées offrent un aussi grand nombre de phthisies pulmonaires et de catarrhes chroniques que l'île de Maurice."

¹⁰ Lostalot-Bachoué, 'Étude sur la constitution phys. et méd. de l'île de Zanzibar,' Par., 1876, 45.

¹¹ Livingstone, 'Travels,' &c. (abstract in 'Dtsch. Klinik,' 1858, Nr. 42.)

¹² Schwarz, 'Zeitschr. der Wien. Aerzte,' 1858, 152; Egan, 'Med. Times and Gaz.,' 1877, Aug., 112.

¹³ See Boyle, 'Med.-Chir. Account of the Western Coast of Africa,' Lond., 1831, 396; Daniell, 'Sketches of the Med. Topogr. of the Gulf of Guinea,' Lond., 1849, 53, 94, 138, 180; also Moriarty, 'Med. Times and Gaz.,' 1866, Decb., 663 (Gold Coast); Abelin, 'Étude sur le Gabon,' Par., 1872, 31, and Bestion, 'Arch. de méd. nav.,' 1881, Nov., 378 (Gaboon); Moreira, 'Jornal das sc. med. de Lisboa,' xv, 121; and McRitchie, 'Edinb. Monthly Journ. of Med.,' 1852, May, 405 (Benguela).

Thomé, Fernando Po,¹ the Cape Verde Islands,² and the Canaries,³ as well as for *Senegambia*,⁴ *Tunis*,⁵ and *Algiers*,⁶ in which last bronchial catarrh is as common on the coast plains as in the mountainous parts of the country.

In the Western Hemisphere, *Greenland*⁷ is one of the chief northern seats of bronchial catarrh. Next to it come the territories bordering the lower chain of lakes, the Atlantic sea-board of the *United States*,⁸ the Gulf States,⁹ the plateau of Texas,¹⁰ and the mountainous regions on the eastern side slope of the Rocky Mountains.¹¹ On the other hand, the Pacific coast, together with the plateaus and valleys on the western slope of the Rocky Mountains,¹² enjoys a comparative

¹ Iglesias y Pardo, 'Observ. teor.-prat. sobre las fiebres African. de Fernando Po,' &c., Ferol, 1877.

² Hopffer, 'Arch. de méd. nav.,' 1877, Mars, 179.

³ Ref., ib., 1867, Avril, 252; Deblenne, 'Essai de géogr. méd. de l'île de Nossi-Bé, &c.,' Paris, 1883, 222.

⁴ Thévenot, 'Traité des malad. des Européens dans les pays chauds, &c.,' Par., 1840, 248; Berville, 'Remarques sur les maladies du Sénégal,' Par., 1857; Chassaniol, 'Arch. de méd. nav.,' 1865, Mai, 510; Thaly, ib., 1867, Mars; Berger, 'Considér. hyg. sur la bataillon des Tirailleurs Sénégalais' (1863-65), Montp., 1868, 48; Rey, 'Arch. de méd. nav.,' 1877, Juin, 401 (for Portuguese Senegambia); Borius, ib., 1882, Avril, 312.

⁵ Ferrini, 'Saggio sul clima e sulle precipue malattie . . . di Tunisi,' Milano, 1860, 187.

⁶ See Haspel, 'Maladies de l'Algérie,' Par., 1852, ii, 418; Bertherand, 'Médecine et hygiène des Arabes,' Par., 1855; Deleau, 'Mém. de méd. milit.,' 1842, lii, 230; Villette, ib., 1842, liii, 125; Finot, ib., 1843, lvi, i; Cambey, ib., 1844, lvii, 1; Bazille, 'Gaz. méd. de l'Algérie,' 1868, Nr. 3; Challan, ib., Nr. 7, Feuille.

⁷ Cranz, 'Historie von Gronland,' Barby, 1770; Lange, 'Bemaerkn. om Grönlands Sygdomsforhold,' Kjöbenh., 1864, 11.

⁸ See Forry, 'The Climate of the U. S., &c.,' New York, 1841, and 'Statist. Reports on the Sickness and Mortality in the Army of the U. S.,' Washington, 1856 and 1860; Drake, 'Treatise on the Principal Diseases of the Interior Valley of North America,' Philad., 1854, ii, 891; Callaghan, 'Amer. Journal of Med. Sc.,' 1828, Nov., 36 (Pennsylvania); Tidyman, 'Philad. Journ. of Med. and Phys. Sc.,' 1826, Aug., xii, 326.

⁹ Posey, 'Transact. of the Amer. Med. Assoc.,' 1857, x (Georgia); Heustis, 'Amer. Journ. of Med. Sc.,' 1831, May, 94 (Alabama).

¹⁰ Swift in 'Report on the Sickness and Mortality in the Army of the U. S.,' 1856, 378; Crawford, ib. 386.

¹¹ See Harvey's account ('New York Med. Record,' 1879, April, 345) for the basins of the Red River and Milk River in Montana and Dakota Territories.

¹² Blake, 'Amer. Journ. of Med. Sc.,' 1852, July, 53; Stillman, 'Edinb. Med. and Surg. Journ.,' 1852, Oct., 299, and Griffin in 'U. S. Army Report, 1856,' 478 (asserting the rare occurrence of bronchitis, &c., in Northern and Southern Cali-

freedom from catarrhs, and particularly from the severer forms of them. In *Mexico*¹ and *Central America*² these maladies are by no means rare on the coast, but they are much more common on the plateaus, particularly on the "tierra fria" of Mexico and the table-land of Costa Rica.

Among the countries of the world little troubled by bronchitis, the *West Indies*³ take a particularly high place, only a few unhealthy spots in St. Martin,⁴ Guadeloupe,⁵ Martinique⁶ and Barbadoes⁷ making an exception. The coast of *Guiana* has, like the latter, no immunity; indeed, bronchial affections are very commonly met with, particularly among natives and negroes.⁸

From *Brazil* we have accounts of the very frequent occurrence of acute and chronic bronchial troubles, both on the coast and in the interior, and particularly in the southern provinces.⁹ They are equally common on the littorals of the *River Plate States*,¹⁰ of *Chili*,¹¹ *Peru*,¹² and *Ecuador*,¹³ as

fornia). Also Bartholow, 'Amer. Journ. of Med. Sc.,' 1860, April, 323, for Fort Bridger (plateau of Utah), and Haden in 'U. S. Army Report, 1856,' 478, for Fort Steilacoom (Washington Territory).

¹ Naphegyi, 'New York Journ. of Med.,' 1855, May; Hammond in 'U. S. Army Report, 1856,' 419; Müller, 'Monatsbl. für med. Statist.,' 1857, Nr. 6, 41; Newton, 'Med. Topog. of the City of Mexico,' New York, 1848; Heinemann in 'Virchow's Arch.,' 1867, xxxix, 607, and 1873, lviii, 178.

² Bernhard, 'Deutsche Klin.,' 1854, Nr. 8; Buel, 'Amer. Journ. of Med. Sc.,' 1859, Jan., 135; ref. in 'Arch. de méd. nav.,' 1864, Sept., 188.

³ Desportes, 'Hist. des malad. de St. Domingue,' Par., 1770, i, 32; Hunter, 'Obs. on Diseases of the Army in Jamaica,' Germ. ed., Lpz., 1792, 222; Dutroulau, 'Traité,' &c., Par., 1861, 35; Moulin, 'Introduction à la pathol. de la race Nègre dans les pays chauds,' Par., 1866, 32.

⁴ Hamon-Dufougeray, 'Arch. de méd. nav.,' 1883, Jan., 57.

⁵ Carpentin, 'Étude hygièn. et méd. de Camp-Jacob (Guadeloupe),' Par., 1873, 38.

⁶ Ruz, 'Arch. de méd. nav.,' 1869, Juin, 425.

⁷ Jackson, 'Bost. Med. and Surg. Journ.,' 1867, July, 447.

⁸ Scholler, 'Diss. sistens observ. super morbos Surinamensium,' Gott., 1781; Bajon, 'Nachrichten zur Geschichte von Cayenne,' from the French, Erfurt, 1780, ii, 60; Segond, 'Revue méd.,' 1836, Nov.; Laure, 'Considér. prat sur les maladies de la Guayane,' Par., 1859, 46; Dutroulau, 'Traité,' &c., p. 20.

⁹ Sigaud, 'Du climat et des maladies du Brésil,' Paris, 1844, p. 112; Rendu, 'Études topogr. et méd. sur la Brésil,' Paris, 1848, p. 67; Schwarz, 'Zeitschr. der Wien. Aerzte,' 1858, p. 578.

¹⁰ Brunel, 'Obs. topogr. et méd. faites dans le Rio-de-la-Plata,' Paris, 1842, p. 36; Férís, 'Arch. de méd. nav.,' 1879, Oct., p. 254.

¹¹ Lafargue, 'Bullet. de l'Acad. de méd.,' xvii, 189; ref. in 'Arch. de méd.

well as at many places on the table-land of the last-mentioned, where acute and chronic catarrhs, known under the name of "pecheguerras," are reckoned, together with their after-effects, as among the most frequent and most dreaded of maladies.

§ 2. INFLUENCE OF SEASON, CLIMATE AND WEATHER.

The diseases of the respiratory organs which we are now considering arise, it is well known, under the influence of various etiological factors. Sometimes they are the outcome of a specific infectiveness, as in the processes of measles, typhoid fever, and other infections; at other times they result from mechanical or chemical excitation of the mucous membrane by things gaseous, or by solid particles suspended in the atmosphere. Or, again, they may be the consequence of local disorders in other organs of the body, particularly the circulatory, or even in other parts of the respiratory apparatus itself. But principally, and in by far the larger number of cases, they are associated in their development and continuance with *meteorological influences*, with those states of weather, namely, which are commonly reckoned as causes of chill. So closely associated are they with these influences that their distribution on the great scale over the globe, as we have already seen, and the number of cases in each locality, would appear to follow geographical position just in so far as the etiological factor in question makes itself felt in the climatic conditions of the place; so that many tropical and sub-tropical regions are subject to these maladies no less than higher latitudes.

Among observers everywhere and at all times there has been complete agreement that the greatest amount of the sickness falls in the colder *seasons* and the least in the warmer. The opinions do not begin to diverge, until

nav.,' 1864, Juill., p. 21, Août, p. 103; Boyd, 'Edin. Med. Journ.,' 1876, Aug., p. 110.

¹¹ Smith, 'Edin. Med. and Surg. Journ.,' 1842, April, p. 359, and 'Brit. and For. Med.-Chir. Rev.,' 1856, Oct.; Tschudi, 'Oesterr. med. Wochenschr.,' 1846, p. 660, and ref. in 'Arch. de méd. nav.,' 1864, Sept., p. 188.

¹² Ref. ib., Oct., p. 246; Gayraud et Domec, 'Montpel. méd.,' 1878, Juill., p. 6.

we come to inquire what is the important factor among the meteorological conditions proper to the cold season—whether it be the cold by itself, or severe changes of temperature with raw and cutting winds, or an increased degree of atmospheric moisture, or several of these things together. That it is not the influence of *low temperature* or *winter cold* by itself which gives us the absolute and essential cause of catarrhal affections of the breathing organs, may be inferred partly from the fact that these maladies are almost as common in tropical countries with a winter temperature above 10° C. (50° Fahr.) as they are in higher latitudes with a winter temperature below -5° (23° Fahr.) ; but still more from the circumstance that the largest number of attacks, or the quasi-epidemic occurrence of the malady, by no means falls in the coldest time of the year, but, within the higher latitudes, either in the end of autumn and beginning of winter, or when the cold of winter is declining and spring setting in, and, in tropical and sub-tropical countries, during those transition-months which correspond to our autumn and spring : in those seasons, accordingly, when sudden and severe *changes of temperature*, along with keen and raw *winds*, are experienced in an altogether unusual degree. But there is evidence that even these weather-influences do not in themselves make up the decisive etiological factor for the prevalence of catarrhal maladies of the respiratory organs, in the fact that there are localities, as we shall see in the sequel, whose climate is distinguished precisely by those severe changes of temperature and by strong winds, although they enjoy a comparative immunity from catarrhs. The key to the problem seems to lie rather in the influence of a high degree of *atmospheric moisture*, the periodical occurrences of which do in fact depend upon extreme changes of temperature and cold winds when the dew-point is high or the atmosphere saturated with aqueous vapour.

§ 3. IMMUNITY OF DRY CLIMATE AND SEASONS, AND LIABILITY OF DAMP.

We find the best evidence of these propositions in the fact that those parts of the world which enjoy an absolute or rela-

tive freedom from catarrhs of the respiratory organs are distinguished by one or other of the following kinds of climate :

(1) *High and uniform temperature with low dew-point*, a state of matters met with especially in tropical and sub-tropical regions, such as many parts of India, the West Indies, southern California, and Egypt.

(2) *Prevailing dryness of the air*, of which we have truly classical examples in many parts of America, such as the elevated prairies of the Western States (Illinois, Missouri, Wisconsin, Iowa),¹ and the high table-lands on the western side of the Rocky Mountains, not to mention many localities in the Eastern Hemisphere.

Writing from Winnebago, Wisc., situated on the Fox River, in $43^{\circ} 34' N.$, at an elevation of 700 feet, with a mean temperature for the year of $50^{\circ} 7' R.$ (44° Fahr.), and with a very great diurnal range, Foot remarks that "complaints of the lungs are less common here than at any part at which I was ever stationed. How shall we account for it? Is it the dry atmosphere?"² Others, such as Haden³ for Fort Steila-coom, Washington Territory, and Bartholow⁴ for Fort Bridger, Utah, report to the same effect, all of them dwelling upon the somewhat low average temperature subject to great vicissitudes, together with extreme dryness of the air, as being characteristic of the climate, and emphasising the dryness as the reason why respiratory catarrhs are so rare. Wotherspoon⁵ gives the same explanation in treating of the remarkable rarity of those diseases at Fort Kent, Maine, situated at an elevation of 575 feet in $47^{\circ} 15' N.$, with a mean annual temperature of $2^{\circ} 24' R.$ (38° F.): "This freedom from catarrhal diseases is no doubt in a great measure owing to the peculiar dry, bracing atmosphere of this region. While on the sea-coast, I found that catarrhal diseases originated not so much from sudden vicissitudes of temperature, as from a simultaneous change in the hygrometric condition of the atmosphere."

Not less convincing in the way of positive evidence are the ascertained facts showing the dependence of respiratory catarrhal maladies upon the influence of a high degree of atmospheric moisture, which come to us from the regions most subject to them, such as many parts of North and

¹ See Bradford, 'Notes on the North-West, or Valley of the Upper Mississippi,' New York, 1846.

² 'Statist. Report on the Sickness in the Army of the U. S., 1846,' p. 47.

³ *Ib.*, p. 470.

⁴ 'Amer. Journ. of Med. Sc.,' 1860, April, p. 323.

⁵ 'Statist. Report, &c.,' 1856, p. 27.

South Germany, the coasts and mountainous districts of Britain, the provinces of Holland and Belgium subject to the same climatic conditions, Upper Auvergne, the valleys of the Jura, Roussillon, and other parts of France, the coasts and mountain-regions of the Iberian peninsula, the Tuscan Maremma and the east coast of Southern Italy.

The influence of that etiological factor is equally pronounced in the conditions of sickness within lower latitudes. In those parts of India most affected by catarrhs, such as Sind, the North-West Provinces, the plateau of the Deccan, Pondicherry, and the Cochin coast,¹ as well as in Borneo, the Moluccas and other islands of the Malay Archipelago,² these maladies occur mostly at the beginning and end of the monsoon-seasons, or in the transition-periods corresponding to our spring and autumn. On the southern coast of China they occur every year in spring, and again on the setting in of the cold and damp weather which characterises the winter.³ In the mountainous parts of Syria, also, they occur in spring when the winds are cold and moist. In Polynesia and on the continent of Australia the maximum number of cases occurs at the beginning of the rainy season with abrupt changes of temperature.⁴ The same is the case in the islands of East Africa⁵ and in Abyssinia, referring to which Courbon says: "On le comprend facilement, lorsqu'on songe qu'à cette époque il y a un abaissement de température assez considérable, indépendamment de l'humidité qui règne dans l'atmosphère." In Senegambia these maladies are met with among the natives mostly at the season of enormous fluctuations of temperature, the atmosphere being at the same time charged with moisture.⁶ Speaking of the Guinea Coast and islands adjoining, Daniell says, "Catarrhs and other pulmonic affections are extremely prevalent in the cold rainy months;" and of the same tenor are the statements of McRitchie and Moreira relating to the season of sickness in the southern parts of the West Coast of Africa,

¹ Don, Evans, Young, Dunbar, Webb, Eyre, Day, Huillet, Follet.

² v. Hattem, de Meijer, and accounts from Borneo and Amboina formerly quoted.

³ Pearson, 'Trans. Calcut. Med. Soc.', vi, 345; Armand.

⁴ Brunet, Measser, Charlopin.

⁵ Deblenne.

⁶ Thevenot, Berville, Borius.

particularly Benguela, where the wettest months (June to August) are the most fruitful in catarrhs. There are similar observations from the Western Hemisphere,—from Guiana,¹ Martinique, Guadeloupe and others of the Antilles² which have a special liability to these maladies, from Brazil,³ Chili,⁴ Ecuador, and other countries.⁵

§ 4. ELEVATED REGIONS NOT EXEMPT.

It is *à priori* intelligible that *conditions of the soil*, such as configuration and elevation, and to some extent even the geological characters, should have a determining influence on the frequency (or infrequency) of respiratory catarrhs, inasmuch as they have an influence on the climate of the locality; that these affections, therefore, should be more prevalent on sea-coasts, richly watered plains and plateaus, damp valleys, and the like. But the frequency of these maladies in mountainous regions and on high table-lands as well, has been adverted to several times in the foregoing sketch of the geographical distribution. Nowhere do we encounter that circumstance on a larger scale than in the mountain ranges of the Western Hemisphere known under the names of the Rocky Mountains and the Cordilleras; upon their slopes and plateaus from Texas down to their southernmost spurs in Chili, catarrhal disorders in acute or chronic form take one of the first places among the prevalent diseases of the inhabitants.

§ 5. NATIVES MORE LIABLE THAN FOREIGNERS IN WARM COUNTRIES.

Noteworthy, in connexion with the question before us, is still another fact: that in those regions of the tropics where catarrhal maladies of the breathing organs are common in

¹ Segond, Laure.

² Rufz, Carpentin.

³ Sigaud.

⁴ Boyd.

⁵ Gayraud et Domec, account from Guayaquil, l. c.

general, as on the slopes of the Nilghiri Hills in India,¹ in Cochin China,² Senegambia,³ the East⁴ and West⁵ Coasts of Africa, Guiana, and certain archipelagos of Polynesia,⁶ the natives are much more subject to these diseases than the stranger immigrants from higher latitudes.

It is hardly probable that these differences are based upon the physiological peculiarities of the several *races*. Without doubt the reason lies essentially in the greater indifference with which the natives expose themselves to the influence of the weather, or, in other words, in the lesser protection against the same which their clothing and dwellings afford them. In part, also, the reason may be the greater power of resistance to those influences which the strangers had acquired by a sort of *acclimatisation* at home. It is a well-known fact that persons coming from a warm and equable climate to higher latitudes where catarrhal affections of the respiratory organs are indigenous, are the more easily and the oftener affected by these the greater the difference between the climatic conditions of their new home and their old. It is in the negro race that this fact has been remarked oftenest and most decidedly.⁷

¹ McKay.

² Breton.

³ Thevenot, Berville, Dutroulau (l. c., p. 11), Thaly, Borius, Chassaniol.

⁴ Deblenne.

⁵ McRitchie, Moreira, Daniell, Bestion (for the Gaboon).

⁶ Vinson, Brunet (l. c., p. 25), Messer (l. c., p. 334).

⁷ See Dutroulau, l. c., ii, 134; also Tidyman and Pruner.

CHAPTER II.

SPECIFIC SUMMER CATARRH.

HAY FEVER, HAY ASTHMA, HAY COLD, JUNE COLD, ROSE COLD,
BOSTOCK'S CATARRH.

§ 6. PHENOMENA OF HAY FEVER.

Under these and various other names, derived from the time of the year, the supposed cause, or the author's name, there has been described within recent years a kind of catarrhal affection of the respiratory organs which differs from the ordinary catarrh in the following peculiarities: It occurs exclusively in summer (June to October); those who have had it once are subject to it habitually every year in a more or less acute form; the whole tract of the respiratory mucous membrane from the frontal sinuses downwards is involved, and there is usually also an excitation of the conjunctiva; in severe cases the attack is accompanied with peculiarly intense asthmatic troubles; it is mostly without fever; it lasts from four to eight weeks, according to the severity of the onset; and, but for these annually recurring paroxysms, the patient remains quite free from attacks of the kind.

The disease begins in most cases suddenly, with symptoms of a catarrhal affection of the mucous membrane of the nose, intense feeling of tickling, violent sneezing, and a discharge of serous fluid sometimes tinged with blood. Along with this affection, or sometimes preceding it or following it, there occur signs of irritation in the conjunctiva, with redness and swelling, increased sensibility rising to burning pain, inability to bear the light, a flow of tears, and the discharge of a secretion which is at first serous and afterwards thick and purulent. In many cases the morbid process goes no further than these phenomena; in other cases there are also the symptoms of laryngeal, tracheal, or

bronchial catarrh; and the cases of the latter class are often accompanied by asthmatic attacks of the most intense kind, coming on in paroxysms and rising to a feeling of suffocation. Among other concomitants, there may be also slight irritation of the mucous membrane of the throat and pharynx, a feeling of tickling or burning which extends to the Eustachian tube and may lead to a slight degree of deafness lasting even for a short time beyond the attack itself. It is not often that symptoms of constitutional illness (fever) are remarked; on the other hand, the patients suffer rather frequently from psychical excitement, sleeplessness, increased sensibility, and other troubles, which are to be explained, however, by the state of anxiety that accompanies the morbid condition. The duration of the malady in the slighter cases is about four weeks; in more severe cases it may be prolonged over two months. The issue, however, is always in complete restoration to health, which lasts, irrespective of other illnesses that may befall the patient, until a new seizure the year following.

§ 7. EARLIEST WRITINGS ON SUMMER CATARRH.

The first undoubted reference to this disease occurs in Heberden;¹ but it was not until 1819 that a detailed account of it was given by Bostock,² from observations made upon himself. In a second paper (1828) he added what he had subsequently learned from the cases of other patients; and he gave the malady the name of "catarrhus aestivus" or summer catarrh. Next comes a work on the subject by Gordon, who gave the disease the name of "hay asthma," on the assumption that it was produced by odorous particles given off from certain grasses. His book was followed by a considerable number of papers and writings on this singular malady, the authors being mostly English at first, but afterwards American, French, and Swiss; and they all confirmed or amplified the observations of Bostock.

The interest of the profession was enlisted in the subject more generally by Phœbus, who addressed a circular to a

¹ In his '*Commentarii de morb. hist.*' cap. xxiv, De destillatione (ed. Lips., 1831, p. 72), we read: "Quinque aegris contigit graviter laborare hoc morbo per mensem omni aestate; alium totam aestatem afflixit quotannis." I have had no greater success than Phœbus and others in finding any mention of the disease in earlier writings.

² Bostock's paper, and the other writings referred to in the sequel, are quoted in the alphabetical order of the authors' names at the end of the chapter.

large number of practitioners in Europe as well as to some in other parts of the world, containing questions as to the occurrence of Bostock's summer catarrh and the characters of it; on the basis of information thus collected and of all that was known before, he published in 1862 a monograph on the disease under the title of 'The Specific Catarrh of Early Summer' (*Der typische Frühsommer-Katarrh*). Since that time there have been many new observations published on this peculiar malady; and although these various writings have not provided us with more than a very incomplete view of the *history* and *geographical distribution* of the disease, they still seem to have enlarged considerably the limits within which summer catarrh was formerly believed to be confined; and they have also advanced materially our knowledge of the causal factor that underlies the malady.

Whether the absolute silence of earlier observers concerning this disease warrants the conclusion, as Blackley and others think that it does, of a modern origin, or, at all events, of considerably greater frequency than formerly, appears to me to be very doubtful. I am rather inclined to believe that summer catarrh has shared the same fate in history as many other diseases of rare occurrence; they had remained for long unrecognised in their peculiar features by reason of their rarity; but from the moment that the attention of the profession was directed to them they called forth a peculiar degree of interest, and gave rise to the illusion that they were actually becoming so much the more frequent as the writings about them grew in volume. Hay fever is just the sort of malady, inconsiderable in any case and particularly so in respect of its occurrence among the less well-to-do classes of the people, to lie outside the scope of most practitioners' observations; and even in the present day it remains so. In this way also, as I think, we may explain the circumstance to be afterwards mentioned that nearly all the published cases of summer catarrh, amounting to some three or four hundred, relate to the better-off classes, and that by far the larger number of these have been cases of medical men themselves, who would naturally take a personal interest in the subject.

§ 8. GEOGRAPHICAL DISTRIBUTION: MOSTLY IN THE TEMPERATE ZONE.

In so far as we can form an opinion on the geographical distribution of summer catarrh from the information hitherto published, scanty as it is and clearly very incomplete, the chief seats of the malady are England and part of North America.

As regards *North America*,¹ nearly all the records of cases of hay fever have come from a zone that is bounded on the east by the Atlantic from Virginia up to Eastport in Maine, and on the west by the Mississippi. From the districts north of the St. Croix River and the Great Lakes, as well as from Canada, New Brunswick, and Nova Scotia, we have no information of a single case. In like manner there are almost no accounts of summer catarrh from the Western and Southern States of the Union² (*e.g.* Mississippi and Louisiana). In the medical intelligence from other parts of the Western Hemisphere there is not a word about the disease; and the same is true for *Africa*, *Australia*, *Polynesia*, and most of *Asia*. Only for *India* is there mention made of a few cases on the southern slope of the Himalaya.³ As regards *Europe*, most of the cases of summer catarrh come from *England*.⁴ In that country the malady appears to be much more common in some districts (*e.g.* the shores of the Bristol Channel) than in others (*e.g.* the Eastern Counties); while in *Scotland* and in *Ireland* (according to Thompson) it is almost unknown. Of isolated cases there are accounts also from various parts of *France*,⁵ *Belgium*,⁶ *Germany*,⁷ *Switzer-*

¹ See the list of writings by Philadelphian practitioners given in chronological order in the 'North Amer. Med. and Surg. Journ.,' April, 1829, p. 335; also the papers of Drake (Cincinnati), Roberts, Hoppin (New England States), Smith, Hoover, Hutchinson, Wyman (the chief authority), Patton, Seguin, Beard, Bell, Ashhurst, Woodward, Sajous.

² Beard, Wyman, Patton.

³ Blackley.

⁴ Bostock, Gordon, Elliotson, Prater, Williams, Cheyne, King, Gream, Mackenzie, Kirkman, Salter, Thompson, Waters, Blackley, Thorowgood.

⁵ Cazenave for Bordeaux, Lafargue for Toulouse, Fleury, Dechambre, Hervier, Guéneau de Mussy and Giffé for Paris, Decaisne for various parts of the country.

⁶ Phœbus, pp. 99, 101, 103.

⁷ *Ib.*; also Alfter, Ferber, Binz (1869: treating of a case seen by himself);

land,¹ Norway,² and of one case each from Sweden³ and Russia.⁴

§ 9. INFLUENCE OF THE SUMMER SEASON.

Although our information as to the occurrence of summer catarrh in various parts of the world is defective; still the entire absence of intelligence about it from lower latitudes,⁵ such as the Southern States of the American Union in contrast to the Northern and Central States, seems to indicate that *climatic influences* are not without importance for the production of the malady. Assuming this to be a correct inference, the influence of climate must bear not so much upon the individual himself as upon the external world around him. The proof of that is the fact that, in all those countries within higher latitudes where the malady has been observed hitherto, the onset of the disease in those subject to it has always happened in the warmest *season*, especially in June, July, and August, or it may have been occasionally a little earlier or later; and that the severity of the attack has been for the most part in direct proportion to the high *temperature*. "Hot, dry, dusty weather with a bright sun," says Wyman with reference to the influence of the weather on the severity of the attack, "is on the whole the combination most to be dreaded;" and all the authorities express a similar opinion. Whenever the temperature falls, the symptoms vanish; and there has never been a seizure in late autumn, in winter, or in early spring. Just as we can hardly explain the immunity of residents in warm climates from summer catarrh by any effects of the somewhat high temperature upon them; so, conversely in the case of those who do suffer from the malady, there is no direct connexion

same writer, 1875, with notices by Busch for Bonn, Unna for Hamburg, and others. See also Lühe, Schmidt.

¹ Phœbus, J. c., Cornaz (Neuchâtel), Perey (Canton Vaud).

² Schönberg, Lindsæth, Kjöning (various parts of the country).

³ Glas (Upsala)

⁴ Kernig (St. Petersburg).

⁵ The few cases of summer catarrh in India have all been met with on the slopes of the Himalaya; in regions, accordingly, with a temperate climate.

to be traced between that supposed etiological factor and the incidence of the disease. Whenever those who are its victims remove to a locality suited to them, they remain free from attacks, notwithstanding that the weather-conditions are in operation the same as before.

§ 10. THE CAUSE A LOCAL ONE.

From the fact last mentioned, we may conclude with all certainty that the production of the disease is bound up with certain *factors of locality*, which take effect under the influence of high temperature; the individual escaping from the seizure accordingly, if he withdraw himself from those influences. Experience has taught us in regard to this, that the onsets are much rarer and milder at the seaside than in the interior, and in hilly woodland country than in cultivated plains, particularly meadow land; that the patient experiences much greater comfort when he resides in a town than when he is in the country; that it is more advantageous even to remain indoors than to be in the open air; and that a trip to sea is the most certain means of warding off the attack.

§ 11. EVIDENCE THAT IT IS CAUSED BY GRASSES IN FLOWER, MORE PARTICULARLY BY THEIR POLLEN.

Upon this the question arises, whether the noxious agent is not to be looked for in something rising from the ground. There are numerous experiences which have been taken to support the theory that certain substances, given off by grasses or flowers in bloom and passing into the air, may so affect the mucous membrane of the organs of respiration as to occasion the phenomena of irritation that are characteristic of summer catarrh. Those experiences are:—the prompt appearance of the disease, in individuals predisposed to it, as soon as they come under the influence of meadows or fields in bloom; the fact that the time of prevalence of summer catarrh corresponds exactly with the flowering season, that is to say, with the first or second hay-crop;

the circumstance that cases of the malady show themselves earlier in the season according to the forwardness of the vegetation under the high temperature ; and most of all the fact that individuals who have had an annual attack for many years in succession, are altogether spared by the malady or only slightly affected whenever they place themselves out of reach of the noxious influence by changing their place of residence at the right time.

The literature of summer catarrh abounds in recorded experiences of that kind. Thus, to give only a few of the more noteworthy, Kirkman relates in regard to his own case: "In myself, hay, and especially new mown hay, excites an attack almost instantaneously; and, what seems to me to be especially remarkable and striking, I am always able to detect hay in the neighbourhood even when I do not see it." Elliotson gives the following details from the case of a Bristol practitioner who had himself communicated the facts: "Last week I spent an hour or two among a company of ladies and gentlemen in a hay field; but I soon lost all pleasure in the conversation, in the wine, or in the country sports, and was glad to hide my streaming eyes, running nose, and violent sneezes in a corner of the park, and to escape the condolences of my friends. This afternoon attack in the hay field was certainly the worst that I have ever had." Poyser mentions a lady who was regularly attacked by the malady as soon as the grass began to flower, always becoming worse when she was directly exposed to the smell of grasses in bloom, although she could go through grass fields without harm after the flowering season was past. He adds that the father of this lady is at once affected with inflamed eyes, violent sneezing, coughing, and running at the nose, whenever he comes near a hay field, and that the lady's three sons suffer in the same way under like circumstances, although in a lesser degree. Elliotson gives the following particulars taken from a letter addressed to him by an elderly lady describing her own case: "Since 1798 I have been attacked more or less severely every year by summer catarrh, earlier or later in the year according to the forwardness of the season, but never before the grass was in flower or before I had been out on the meadows. . . . Residence in Ramsgate or Harwich suited me best, for the reason, I suppose, that there is comparatively little hay grown in the neighbourhood of these places. . . . I often had an attack of sneezing and oppressed breathing when the children came to me after spending some time in the fields. . . . Once, at Harwich, I became suddenly ill while taking a walk along the shore; this surprised me, as there did not seem to be any hay near; but next day I found the explanation to be that hay-making was going on at the top of the cliff while I was walking under it. . . . In the year 1817, I became so seriously ill at the time of the hay-making in our own fields that I was with diffi-

culty carried from my bed to the carriage, to be driven to Harwich some twenty miles off; but when I got there I felt so much better that I was able to mount to my bedroom without help. . . . Of late years, having avoided on all occasions the neighbourhood of mown hay as much as I could, I have suffered less than I used to. . . . An uncle and a nephew of mine are subject to the malady in the same way, and they also are of opinion that the smell of the hay is the cause of it; my nephew is obliged to go to London whenever the hay-making begins."

The opinion was firmly held for a long time, in accordance with the view of Gordon, who contested Bostock's theory of summer catarrh being the effect of high temperature, and who introduced the popular name of "hay fever," that the real cause of the malady was odorous particles given off from certain grasses and cultivated herbs in flower, such as *Anthoxanthum odoratum* (spring grass), *Ambrosia artemisiæfolia*, *Holcus odoratus* (Guinea wheat), *Melilotus*, *Asperula odorata* (woodroof) and a few more. On the other hand, the recent experiments made by Blackley upon himself and upon other persons suffering from summer catarrh, go to prove that it is not the odorous particles, but the pollen that constitutes the pathogenetic factor in those who are predisposed to the malady, a notion that had been previously held conjecturally by Elliotson,¹ one of the earliest writers on summer catarrh, and after him by Gream.

Blackley showed by the experiment of exposing to the air plates of glass coated with a sticky substance, that the pollen is carried to great distances by the atmospheric currents both upwards and transversely. This was not unknown before; but he ascertained at the same time the remarkable fact that the quantity of pollen was considerably greater in the upper strata of the atmosphere than in the lower. He showed also that the quantity of pollen in the air was a good deal less in damp weather; that there was much more of it, for obvious reasons, in the air of the country than in the atmosphere of large towns; and that in England it attained a maximum between the end of May and the end of June. Himself a sufferer from habitual summer catarrh, he proved further that the introduction of pollen into the

¹ "I certainly believe that it does not depend upon the hay, and therefore ought not to be called hay fever, but upon the flower of the grass, and probably upon the pollen."

nose gave rise in his own case to a series of phenomena which were wholly the same as those observed in the disease, and that the inhalation of pollen by the breath was followed by corresponding symptoms in the larynx and bronchi. The notion that summer catarrh was really due to that cause found special support in the fact that the annual onsets of it befell exactly at the time when the air contained most pollen, and that the symptoms were the more intense, the more abundant was the pollen in the atmosphere. An application of the suspected agent to the nasal mucous membrane of a person suffering from chronic coryza, but not liable to summer catarrh, produced one paroxysm of sneezing, but was otherwise without effect.

The conclusion which Blackley draws from his experiments has found at least a partial confirmation in the observations of Lühe and Patton.

Helmholtz, who is a sufferer from habitual summer catarrh, had been led to think that "organisms" might be the cause of the malady; and for five successive years he examined the mucus secreted from the nose at the time of the attack, finding in it a number of minute bodies joined in twos or fours and engaged in active movement, or grouped together in rows; these he pronounced to be "vibrios." Lühe found the same objects on examining the nasal mucus of a lady during one of her attacks of summer catarrh; but he satisfied himself that these minute bodies, which were partly in active molecular movement, and partly embedded in zoogloea masses, were not vibrios, but the finely granular contents of burst pollen grains, and that there occurred along with these certain larger refracting cells, oval or pear-shaped, which, on being made to develop in mucus from his own nose, swelled into spherical bodies and at length burst, discharging the same finely granular substance and thereby proving themselves to be pollen grains. Patton came to the same conclusion after examining the nasal mucus of a hay-fever patient during two successive seasons.

These observations, along with the fact that the nasal mucus of hay-fever patients at other times than during the attack, as well as the mucus of those who are not liable to the disease, is never found to contain the bodies in question,

make it a very plausible idea that the pollen grains or their finely granular contents are the cause of the malady. The way in which they act, whether mechanically or chemically, still remains a question; and still more is the question an open one, whether the entrance of pollen into the respiratory organs is in truth the sole cause of so-called summer catarrh. Patton has expressed doubts on the point; and Blackley himself, the founder of the theory which has come to be very generally accepted, will by no means maintain that "pollen grains are the only things capable of producing the symptoms of hay fever. So far from thinking so am I, that I concluded my book with the following sentence:—'I am of opinion that there are other things to be found, which can produce symptoms analogous to those of hay fever.'" Among these agents, according to Roberts, Beard, Wyman, and others would be dust, smoke, or the like, especially such as is encountered on the railway.

But it will be seen from Woodward's lately published experiments made on himself that we are still some way from a satisfactory explanation of the morbid process. For weeks together he has kept flowering plants on his writing table, so that the table was constantly covered with pollen; he made hundreds of microscopic examinations of specimens of pollen; and yet he remained perfectly well to the end of the hay-fever season, having continued the experiment up to the 20th of August. In judging of the question, it ought also to weigh in the scale that the residents in the open country, who are much more exposed to the effects of pollen than the dwellers in towns, suffer from summer catarrh much less frequently than the latter; also that the malady is much more common among the well-to-do classes (tradesmen, professional men, handicraftsmen) than among the labouring class, there being only 8 cases of the latter out of a total of 154 collected by Phœbus.

§ 12. STRONG PREDISPOSITION OF INDIVIDUALS; RUNS IN FAMILIES.

Whatever the cause of summer catarrh may be, the rarity of its occurrence, the quite casual instances of it within a

wide circle where the etiological factor must be universally at work, and the failure hitherto to induce an attack of the disease artificially by introducing pollen into the nose of anyone not an habitual sufferer,—all these facts leave no doubt that the incidence of the malady in individuals postulates a decided and peculiar *predisposition* to the same. Of the nature of that predisposition we are as little able to form a certain opinion, as we are of the cause of the disease itself. That it is not an affair of *idiosyncrasy*, in the ordinary meaning of the term, is clear enough; and therefore it appears to be inadmissible to compare the morbid condition with the symptoms that show themselves in many persons after partaking of shell-fish and certain kinds of fruit, especially in the uncooked state. There is just as little reason to refer the predisposition, as is often done, to an exaggerated nervous sensibility, or *nervous irritability*, or whatever other name it may be known by; for the reason that any such morbid exaltation cannot be shown to exist in regular sufferers from hay fever patients, at times when the malady is not upon them, and that women, who are distinguished by their nervous excitability, are much less subject to the malady than men. Of 154 cases collected by Phœbus, 104 were men and 50 women. In a total of 101 cases, Wyman reckons 72 men and 29 women.

It would be more reasonable to look for the predisposition in some anatomical peculiarity of the organism; and in favour of that there is the fact that the malady is particularly common in some families. Evidence of this will be found in several of the cases mentioned above, as well as in the writings of Wyman¹ and Phœbus.² Of 59 patients, in regard to whom Phœbus was able to procure tolerably accurate information on that point, 23 occurred alone in their respective families, and 36 were associated with one or more others. The whole of the latter occurred in thirteen families, being distributed as follows:—in eight families, two members affected (brothers and (or) sisters in 5 cases, father and child in 3 cases); in two families, three members; in one family four members; and in two families five members. Out of 80 cases published by Wyman, there were 18

¹ L. c., p. 102.

² L. c., p. 92.

in which more than one member of the family suffered; but he considers that his information on the point is incomplete, and that the proportion is really greater than that.

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CHAPTER III.

WHOOPIING-COUGH.

§ 13. HISTORICAL REFERENCES.

THE *history of whooping-cough* cannot be followed farther back than the middle of the 16th century. There are, it is true, historians who believe that they have found indications of the disease in the medical writings of antiquity and of the Arabian period, as well as in the physicians and chroniclers of the middle ages. But all these statements rest, as I have satisfied myself, upon arbitrary interpretations of the text or upon errors of diagnosis, such as the confounding of whooping-cough with influenza, an error towards which the application in France of the popular name "*coqueluche*" at one time to that disease and subsequently to whooping-cough, has contributed a good deal.

The first undoubted information about whooping-cough dates from 1578, for which year Baillon¹ gives an account of an epidemic of the disease in Paris ("*tussis quinta seu quintana, quod certis horis repetit*"), adding the noteworthy remark that "*nondum quemque auctorem legi, qui de ea tussi verba faceret,*" although he speaks of the disease in a general way as one that was well known and as a phenomenon by no means new or remarkable. It is to the same epidemic, without doubt, that the notice of Schenk von Grafenberg² refers ("*tussis nova Lutetiae quinta dicta pueros comprimis infestans*"), although he himself gives no detailed account of the malady. In the writings of the later physicians of the 16th century, which are otherwise very copious in their epidemiological information, there is not a word said

¹ '*Epidem.*,' lib. ii, "*Constitutio anni 1578,*" op. Genev., 1762, i, 165, 173.

² '*Observ. med. lib. duo de tussi.*' *Observ.* i, Frankf., 1665, p. 237.

of whooping-cough. For the century following we have only occasional references to it—by Ettmüller,¹ Willis,² and Sydenham.³ It is not until the 18th century that we meet with a succession of accounts of whooping-cough epidemics, following on the two earliest considerable treatises on the disease by Alberti⁴ and Friedrich Hoffmann,⁵ both of Halle.

§ 14. GEOGRAPHICAL DISTRIBUTION.

It is impossible to decide whether the silence of practitioners about whooping-cough in former periods, when taken with the steadily increasing information on the disease in the last century and the present, justifies us in concluding that the malady is really of modern origin, and that it has spread gradually over the globe within recent times. It is at all events noteworthy that in some countries remote from the general stream of traffic whooping-cough has not been observed until recently, and that in these the fresh outbreaks of the disease, separated as they have been by wide intervals of time, have always been traceable to importation from without. That is a circumstance which proves at least that the native habitat of whooping-cough is by no means so extensive as its present *geographical distribution*.

In *Europe*, where whooping-cough is on the whole tolerably uniform in its diffusion, *Iceland*⁶ forms one of those exceptional areas. Only four instances of it in all have been found hitherto, during the present century, (in the years 1826 and 1839), and each time imported; Finsen⁷, during a ten years' residence on the island, did not meet with it once.

¹ 'De morbis infantum,' op. Lugd., 1685, iii, 70.

² 'De morbis convulsivis,' cap. xii, Amstelod., 1782, p. 92; and 'Pharm. rat.,' lib. ii, sect. i, cap. 6, ed. cit., p. 168.

³ 'Constitutio epid. anni 1670,' op. Genev., 1736, i, 122; and 'Epist. respons. ad Brady,' ed. cit., i, 194 (Greenhill's edition, pp. 187, 294).

⁴ 'Diss. de tussi infantum epidemica,' Hal., 1728.

⁵ 'De tussi convulsiva,' Hal., 1732, op. Genev., 1753, suppl. ii, pars. ii, 224.

⁶ Schleisner, 'Island undersøgt, &c.,' p. 54; see also 'Bibl. for Læger,' 1827 ii, 288; 1841, i, 378.

⁷ 'Jagttagelser angaaende Sygdomsforholdene i Island,' Kjobenhavn, 1874, p. 48.

On the *Finnish Islands*¹ also, according to sanitary reports extending from the middle of the last century down to the present time, there is information of only three epidemics (1778, 1836 and 1855). On the other hand, in the *Scandinavian countries* the disease is met with very extensively. In *Sweden* from 1749 to 1764, upwards of 45,000 children died of whooping-cough;² from 1862 to 1880, according to the official returns, the cases of it were upwards of 80,000.³

It would appear to be no less common in *Norway*,⁴ *Denmark*⁵ and *Russia*,⁶ from which last there are accounts like the Swedish for the Baltic Provinces, St. Petersburg,⁷ *Kasan*,⁸ *Astrakhan*,⁹ *Orenburg*,¹⁰ the *Caucasus*¹¹ and other governments.

The wide diffusion and great frequency of whooping-cough in *Germany*, *Holland*, and *Belgium*,¹² *France*, and the *British Islands* are abundantly testified to in the statistical, medico-topographical and epidemiological writings of those countries. In *Prussia* from 1875 to 1880, nearly 85,000 died of whooping-cough. In *England and Wales* from 1848 to 1855 the mortality from the disease amounted to about 72,000; from 1856 to 1867 it was upwards of 120,000. In *Scotland* it is very common.¹³ In *Ireland* also, according to Wyllie's account,¹⁴ it has the character of an endemic malady, with a mortality that places it fifth among the diseases of the community; in 1841 there were 37,300 deaths from whooping-cough registered in that country.

¹ Account in 'Bibl. for Læger,' 1840, i. 68; 'Sundhedskoll. Aarsberetning for 1853,' p. 29.

² Rosenstein, 'Von den Kinderkrankheiten,' Göt., 1785, p. 596.

³ See 'Sundhetakollegii Berättelse' for those years.

⁴ Broch, 'Le royaume de Norvège et le peuple Norvégien, &c.,' Christiania, 1876, 55; see also 'Beretning om Sundhedsstatstanden i Norge.'

⁵ See the public health reports in 'Bibl. for Læger' and 'Sundhetakollegiums Forhandling.'.

⁶ Moritz, l. c.

⁷ Attenhofer, l. c., 242.

⁸ Erdmann, l. c., 161, 253.

⁹ Hermann, 'Med. Ztg. Russl.,' 1845, 188.

¹⁰ Maydell, l. c.

¹¹ Hirtzius, 'Russ. Samml. für Natur- und Heilkde.,' 1815, i. 562; Lieben, 'Petersb. med. Zeitschr.,' 1866, xi, 281.

¹² Meynne, 'Topogr. méd. de la Belgique,' Brux., 1865, 234.

¹³ 'Edinb. Med. and Surg. Journ.,' 1811, Jan. 16.

¹⁴ Ib., 1845, April, 257.

The information about whooping-cough from the southern countries of Europe is so defective and covers so short periods that it is impossible to say whether the disease is less common or less severe in them than in the northern regions of the Continent. For the *Iberian peninsula* the epidemiological data as to whooping-cough would indicate that the disease was at all events not uncommon. In Italy, from which there come very many accounts of whooping-cough epidemics, it is a truly endemic form of sickness.¹ For *Roumania*,² also, as well as *Turkey*³ and *Greece*,⁴ there is no lack of information as to the epidemic occurrence of the disease and its general diffusion.

From the western parts of Asia I know of only one notice of whooping-cough, that by Tobler,⁵ according to whom it has been observed as an epidemic not unfrequently in *Palestine*. From *India* again, there are accounts of whooping-cough which serve to show that it often prevails both very extensively and also in parts of the country widely remote, such as Mirzapore⁶ (province of Agra, in the basin of the Ganges), Simla and Mussouri (6500 to 8000 ft.),⁷ Pondicherry and neighbourhood,⁸ the Nilghiri Hills,⁹ Cochin¹⁰ (southern part of the Malabar Coast), and Bombay.¹¹ The same holds good for Java,¹² Sumatra,¹³ Borneo¹⁴ and other islands of the

¹ Parola, 'Geografia nosol. dell' Italia,' Torino, 1881, 494, 575.

² Barasch, 'Wien. med. Wochenschr.,' 1854, Nr. 37.

³ Rigler, 'Die Türkei und deren Bewohner,' ii, 221.

⁴ Olympios, 'Bayer. med. Correspondenzbl.,' 1840, 181.

⁵ 'Beitrag zur med. Topogr. von Jerusalem,' Berl., 1855, 41.

⁶ Evans, 'Edinb. Med. Journ.,' 1855, Aug., 176.

⁷ Ireland, *ib.*, 1863, Jan., 613; Farquhar, 'Ind. Annals of Med. Sc.,' 1863, April, 463.

⁸ Huillet, 'Arch. de méd. nav.,' 1868, Févr., 82; Auboeuf, 'Contrib. à l'étude de l'hyg. et des malad. dans l'Inde,' Par., 1882, 58.

⁹ Mackay, 'Madras Quarterly Journal of Medical Science,' 1861, July, 27.

¹⁰ Day, *ib.*, 1862, Jan., 34.

¹¹ Morehead, 'Clin. Researches on Disease in India,' Lond., 1856, i, 362. There is an interesting notice in the 'Lond. Med. and Phys. Journ.,' lxii, 21, of an outbreak of whooping-cough among the children on board a transport which sailed from Bombay in January, 1823.

¹² Heymann, 'Tropenkrankheiten,' p. 164.

¹³ v. Leent, 'Arch. de méd. nav.,' 1877, Févr., p. 100.

¹⁴ *Id.*, *ib.*, 1872, Janv., p. 21.

Malay Archipelago, as well as for the southern littoral of *China*¹ and for *Japan*.²

In *Australia* and *Polynesia* whooping-cough has not occurred until recent times. The first accounts of it date from the third decade of the present century, at which time the disease was imported into Hobart (*Tasmania*) and became somewhat prevalent there;³ thence it came to Sydney and to the western parts of the Australian continent.⁴ Both in *Tasmania* and in *Australia* it has been observed to become epidemic several times, as in the years 1842-43 and 1855⁵. In the *Hawaiian Islands* it showed itself first towards the end of the thirties as a widespread epidemic;⁶ but it had not recurred there down to 1855.⁷ In *New Zealand*⁸ it first appeared in 1847, as a form of disease not known there before. On the *Navigators' Islands*⁹ it was epidemic in 1849. In *Tahiti* it is now of frequent occurrence, particularly among the children of Europeans.¹⁰

From the continent of *Africa* and the islands belonging to it, we have information of the prevalence of whooping-cough in only a few regions, such as *Mauritius*,¹¹ *Madagascar*,¹² *Cape Colony*,¹³ the interior parts of *South Africa*,¹⁴ the

¹ Hobson, 'Med. Times and Gaz.' 1860, Nov., p. 475. According to Dudgeon ('Glasg. Med. Journ.' 1877, July, p. 328), whooping-cough would appear to be rare in Pekin. On the other hand there is a notice (in 'Leudesdorf's Nachrichten,' 1876, x, 28) of a very extensive epidemic of it there among the native Chinese in the autumn of 1874 and winter of 1874-5.

² Simmons, 'New York Med. Record,' 1881, Jan., 91.

³ Scott, 'Transactions of the Provincial Medical Association,' 1835, iii, App. xii.

⁴ Milligan, 'Transactions of the Calcutta Medical Society,' 1839, viii, App. xi.

⁵ Power, 'Dubl. Journ. of Med. Sc.,' 1843, March; Hall, 'Transact. of the Epidemiol. Soc.,' 1865, ii, 74.

⁶ Jarvis, 'Hist. of the Hawaiian Islands,' Lond., 1843.

⁷ Gulick, 'New York Journ. of Med.,' 1855, March.

⁸ Thomson, 'Brit. and Foreign Med.-Chir. Review,' 1855, Oct.; 'Edinb. Med. Journ.,' 1863, Sept., 220.

⁹ Turner, 'Nineteen Years in Polynesia,' Lond., 1861, 536.

¹⁰ Ref. in 'Arch. de méd. nav.,' 1865, Oct., 289.

¹¹ Ref. in 'Brit. Med. Journ.,' 1872, Nov., 586.

¹² Borchgrevink, 'Norsk Mag. for Laegevidensk.,' 1872, iii; Raekke, ii, 234.

¹³ Scherzer, 'Ztschr. der Wiener Aerzte,' 1858, 166; Lawson, 'Transact. of the Epidemiol. Soc.,' 1865, ii, 292.

¹⁴ Livingstone, 'Travels' (extract in 'Deutsche Klin.,' 1858, 401).

Western Soudan,¹ *Algiers*² and *Egypt*.³ The accounts from all of these regions seem to indicate that the malady is by no means rare. It is questionable whether we are to infer from the silence of observers in regard to it in other parts of that continent, such as the *West Coast*, that whooping-cough does not occur in them.

In the *northern territories* of America and in the *United States*, whooping-cough is met with as widely and as frequently as in Europe. In *Greenland* it appeared epidemically for the first time in 1838, having been imported; it has been prevalent there on several occasions subsequently down to the year 1849; but since that year it has not been seen.⁴ There are scattered notices of it from *Nova Scotia*, *New Brunswick*, and *Canada*. In the *New England* and *Central States* of the American Union whooping-cough counts among the prevalent diseases; and the same holds for the large territory included within the *Mississippi valley*, where, according to Drake,⁵ "this malady is perhaps always prevailing in some part." It is true also for *South Carolina*,⁶ *Georgia*,⁷ *Alabama*,⁸ *Louisiana*,⁹ and other *Southern States* on the Atlantic and Gulf coasts. In *California* it has become indigenous since 1846, or since the period of immigration on a large scale.¹⁰

In *Guiana* it is rare, as it is also in *Central America*, although there was an epidemic in 1866 in *Costa Rica*, probably an importation from *Nicaragua*.¹¹ On the other hand,

¹ Quintin, 'Extr. d'un voyage dans le Soudan,' Par., 1869, 38.

² Guyon, 'Gaz. méd. de Paris,' 1839, Nr. 46; Bertherand, 'Méd. et hyg. des Arabes,' Par., 1855.

³ Pruner, 'Krankh. des Orienta.,' Erlang., 1846, 125, 286; Pissas ('Congrès des médecins Grecs,' Constantinople, 1883, 17) says that whooping-cough is absolutely rare in Cairo, much rarer than at the coast (Alexandria).

⁴ Lange, 'Bemærkinger om Grønland's Sygdomsforhold,' Kjöbenhavn, 1864, p. 40; see also 'Bibl. for Læger,' 1841, ii, 378, and 'Sundhetakoll. Forhandl.,' 1848, p. 33; 1849, p. 29; 1850, p. 22.

⁵ 'Treatise on the Principal Diseases of the Interior Valley of North America,' Philad., 1854, ii, 828.

⁶ Witsell, 'Charleston Med. Journ.,' 1857, Jan., p. 84.

⁷ Posey, 'Trans. of the Amer. Med. Assoc.,' 1867, x.

⁸ Wooten, 'Southern Med. Reports,' New Orleans, 1851, ii, 337.

⁹ Kilpatrick, ib., p. 176.

¹⁰ King, 'Amer. Journ. of Med. Sc.,' 1853, April, p. 380.

¹¹ Schwalbe, 'Arch. für klin. Med.,' 1875, xv, 336.

there are many published accounts of wide-spread and sometimes pernicious epidemics of whooping-cough in the *West Indies*, including the following: Jamaica¹ in 1865; Santa Cruz and St. Thomas² in 1837, 1841, 1851, 1853, and 1859; St. Bartholomew³ in 1804, 1809, and 1812; Guadeloupe,⁴ where it is common and universally diffused; Martinique,⁵ where there were three epidemics between 1837 and 1856 (in 1837, 1845, and 1852); St. Lucia⁶ in 1831 and 1845; Barbadoes⁷ in 1753; and Granada⁸ in 1798. Authorities are unanimous as to its frequent occurrence in *Brazil* and the *Argentine States*;⁹ for *Chili* I know of only one notice, referring to an epidemic at Santiago in 1873;¹⁰ in *Peru* it is often met with in the mountainous districts and on the plateaus, whereas it occurs very rarely on the coast or in the "montana" region.¹¹

§ 15. INFLUENCE OF CLIMATE AND SEASON.

While the information before us goes to show that the geographical distribution of whooping-cough now extends over nearly the whole of the habitable globe, it is unmistakeable, on the other hand, that the amount of the sickness

¹ Ref. in 'Lond. Med. Repository,' xxiv, 168.

² Ref. in 'Bibl. for Laeger,' 1840, i, 234, and in 'Sundhetskoll. Forhandl.' for the years 1843 (p. 45), 1853 (p. 37), 1856 (p. 69), 1860 (p. 409).

³ Forström, 'Svensk Läk. Sällsk. Handl.,' iv, 233; Leurén, ib., ii, Heft 2, p. 174.

⁴ Carpentin, 'Étude hyg. et méd. du Camp Jacob, Guadeloupe,' Paris, 1873, p. 38.

⁵ Rufz, 'Arch. de méd. nav.,' 1869, Juin, p. 428.

⁶ Levacher, 'Guide méd. des Antilles,' Paris, 1840, p. 160; Rufz, l. c.

⁷ Hillary, 'Obs. on the Changes of the Air, and concomitant Epid. Diseases in Barbadoes,' Germ. ed., Leipzig, 1776, p. 53.

⁸ Chisholm, 'Essay on the Malignant Pestilential Fever, &c.,' Lond., 1801, i, 61.

⁹ Sigaud, 'Du climat et des maladies du Brésil,' Paris, 1844, p. 357; Bourel-Roncière, 'Arch. de méd. nav.,' 1872, Juill., p. 32. Of epidemics in 1863 and 1875 in Santa Catarina (Brazil), we have an account by Rey, ib., 1877, Jan., p. 30. Mantegazza ('Lettre sulla America meridionale,' Milano, 1860, i, 127) refers to another in Nogoys (Entre Rios).

¹⁰ Boyd, 'Edin. Med. Journ.,' 1876, Aug.

¹¹ Tschudi, 'Oester. med. Wochenschr.,' 1846, p. 476.

and still more its type, is to a certain extent dependent upon influences of climate; or, in other words, the disease is, *ceteris paribus*, not only rarer in the tropical and sub-tropical regions than in higher latitudes, but also less severe, as nearly all authorities assure us. We can understand, *a priori*, why the epidemic extensiveness of the disease, and why the severity of its type in particular, should be under the influence of climatic or meteorological conditions, when we bear in mind that the severity or malignancy of whooping-cough really depends, as experience teaches, upon complications with catarrhal affections of the organs of respiration, the latter being much more common in higher latitudes by reason of those very peculiarities of the weather, than in equatorial or subtropical regions with their more favorable climate. But experience within the higher latitudes themselves, in all that relates to the prevalence of the disease and the death-rate from it in the several seasons and under the influence of the sort of weather characteristic of them, serves to show that this etiological factor is always of secondary importance in producing the malady and in determining its type.

In 495 epidemics of whooping-cough, for which we have precise data regarding the time of their outbreak and prevalence, the season of commencement was as follows :

Winter	139	Summer	119
Spring	131	Autumn	106

The preponderance accordingly falls in winter and spring. In the same 495 epidemics the culminating point was reached as in the following table :

Spring	63	Autumn	77
Spring and Summer	56	Autumn and Winter	29
Summer	57	Winter	62
Summer and Autumn	74	Winter and Spring...	77

According to this, the epidemics extended over a whole season in the following numbers :

Spring	196	Autumn	180
Summer	187	Winter	176

In this view also, spring stands out prominently, summer

and autumn coming next, while winter is the least implicated. But the differences are on the whole slight enough to warrant the conclusion that *the season of the year has no material influence upon the epidemic occurrence of the malady.*

When we come, however, to the *number of cases* of whooping-cough in the several seasons, the inquiry leads to a somewhat different conclusion, as the following statistical data show :

Cases of Whooping-Cough in the several Seasons.

Place.	Period.	Season.			
		Spring. ¹	Summer.	Autumn.	Winter.
Sweden ²	1862-81	18,765	24,220	25,327	17,767
Thuringia ³	1869-76	728	1297	1581	774
Dresden ⁴	1834-77	305	668	646	333
Erlangen ⁵	1819-58	138	254	158	62
Munich ⁶	1859-68	461	583	674	484

According to this, the largest number of cases in each of the localities falls in summer and autumn. Reducing the seasonal prevalence to the proportion per 100, we get the following table :

Percentage of Whooping-Cough Cases in the several Seasons.

	Spring.	Summer.	Autumn.	Winter.
Sweden	21·8	28·2	29·4	20·6
Thuringia	16·6	29·6	36·1	17·7
Dresden	15·6	34·2	33·1	17·1
Erlangen	22·5	41·5	25·7	10·1
Munich	20·9	26·5	30·6	22·0

¹ In the sanitary reports for Sweden, the number of cases is not given for the several months but for quarters. In the other localities, the numbers have been thrown into quarters, the winter quarter beginning with December, the spring quarter with March, and so on.

² From the 'Sundhedskollegii Berättelse.'

³ Lübben, 'Die Krankheiten Thüringens,' Strassb., 1880, p. 55 (reports supplied by various practitioners).

⁴ Unruh, 'Jahrb. für Kinderheilkde.,' 1878, N. F., xii, 248 (Children's Hospital).

The records of whooping-cough epidemics from equatorial or subtropical countries are too few in number to draw safe conclusions from as to the proper season of the disease in those parts of the world. This much, however, follows, that whooping-cough has even in them been met with at all seasons: as at Santa Catharina (Brazil) in the summer of 1863 and in the winter of 1875 (according to Rey); in Martinique from August to March 1837-38, and from March to September 1845; in Santa Cruz in August of 1852, in the spring of 1853, and in the autumn of 1859.

There is not the same agreement about the rate of mortality from whooping-cough in the several seasons, as about its epidemic prevalence:

Deaths from Whooping-Cough according to Season.

Place.	Period.	Season.			
		Spring.	Summer.	Autumn.	Winter.
Sweden ¹	1861-76	496	914	776	699
London ²	1847-53	49·2 ³	30·5	25	43·4
Hamburg ⁴	1873-81	337	328	459	519
Stettin ⁵	1850-63	32	52	72	40
Berlin ⁶	1876-83	814	619	595	810
Thuringia ⁷	1869-76	25	31	36	21
Frankfurt-on-M. ⁸ ...	1863-81	135	188	174	146
Munich ⁹	1859-68	96	63	96	81
Turin ¹⁰	1828-37	222	204	103	148

¹ L. c.

² Smith, 'Trans. Med.-Chir. Soc.,' 1854, vol. 37, p. 243.

³ These figures, taken from Smith's tables, give the average weekly death-rate throughout the season.

⁴ 'Bericht über die med. Statistik des Hamburgischen Staates.'

⁵ Wasserfuhr, in the 'Monatsbl. für med. Statist' (supplement to the 'Deutsche Klinik,' 1866, No. 2, p. 14).

⁶ 'Statist. Jahrb. der Stadt Berlin.'

⁷ Lübken, l. c.

⁸ 'Statist. Mittheil. über den Civilstand der Stadt Frankfurt a M.'

⁹ Ranke, l. c.

¹⁰ Parola, 'Geogr. nosol. dell' Italia,' Torino, 1881, p. 576.

⁵ Küttlinger, 'Bayer. ärztl. Intelligenzbl.,' 1860, vii, 18 (policlinic).

⁶ Ranke, 'Jahrbuch für Kinderheilkde.,' 1869, N. F., ii, 38 (hospitals of the city & the policlinic).

Same Table reduced to seasonal percentage.

	Spring.	Summer.	Autumn.	Winter.
Sweden	17'2	31'7	26'8	24'3
London	33'2	20'6	17'0	29'3
Hamburg	20'5	20'0	27'9	31'6
Stettin.....	16'5	26'7	36'1	20'7
Berlin	28'7	21'8	20'9	28'6
Thuringia	22'1	27'4	31'9	18'6
Frankfurt-o.-M...	21'0	29'2	27'0	22'7
Munich	28'5	18'8	28'5	24'2
Turin	32'8	30'1	15'2	21'8

According to this, the largest number of deaths falls in spring for three of the localities (London, Berlin, Turin) ; in summer for two (Sweden, Frankfurt-o.-M) ; in autumn for two (Stettin, Thuringia) ; in winter for one (Hamburg) ; while spring and autumn have both of them the same high figure for Munich. The minimum mortality falls in spring for three (Sweden, Stettin, Frankfurt) ; in summer for two (Hamburg, Munich) ; in autumn for three (London, Berlin, Turin) ; and in winter for one (Thuringia).

It is impossible to make out how far these maxima and minima of the death-rate from whooping-cough may depend upon the larger or smaller number of the sick, inasmuch as there is a lack of data as to the number of cases for nearly all the localities ; where there are such returns it is impossible to find any correspondence between the maxima and minima of the sickness and those of the mortality, on comparing the figures for each.

Comparative percentages of the Sick-rate and Death-rate from Whooping-Cough in the several Seasons.

	Spring.		Summer.		Autumn.		Winter.	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Sweden.....	21'8	17'2	28'2	31'7	29'4	26'8	20'6	24'3
Thuringia.....	16'6	22'1	29'6	27'4	36'1	31'9	17'7	18'6
Munich.....	20'9	28'5	26'5	18'8	30'6	28'5	22'0	24'2

One other point in connexion with this question is noteworthy, namely, that whooping-cough has been epidemic equally in intense frost (as in 1709 at Berlin, 1744 at Plymouth, 1841-42 at Paris), in moderate summer heat (as in 1743 at Plymouth, 1755 in Cleveland, 1775 at Paris, 1832 at Prague and in Lombardy, 1833 at Vienna and in Canton Thurgau, 1842 at Pforzheim), and in intense heat (as in 1724 at Augsburg, 1773 in Guyenne, 1839 at Besigheim); and that, although the malady has often assumed a specially bad type in cold and wet weather (for reasons above given), there have been malignant epidemics of whooping-cough under the very opposite conditions.

§ 16. INDEPENDENT OF PHYSICAL, SOCIAL AND RACIAL CIRCUMSTANCES.

A glance at the distribution-area of whooping-cough shows that the malady has been found prevalent all over the globe at various *elevations* and on various *configurations* of the surface, and that its occurrence in epidemics has been altogether independent of the *geological* character of the soil. Joachim's¹ opinion that marshy ground would appear to favour its epidemic diffusion is manifestly derived from one-sided observations, and has not been confirmed in the experience of others.

It is equally impossible to prove that *social and hygienic conditions* have even a remote influence on the amount of the sickness. According to experience, whooping-cough is prevalent in all circles of the population, among the children of the rich and of the poor equally; but it would appear to be more destructive among the latter than among the comparatively well-to-do, whose children have better tending, and, in particular, are more protected from the harmful effects of the weather.

Neither do differences of *race and nationality* create a predisposition to or immunity from whooping-cough. According to Heymann and Waitz² the disease in the East Indies is

¹ 'Zeitschr. für Natur- und Heilkde. in Ungarn,' 1851, ii, 12.

² 'On Diseases incidental to Children in Hot Climates,' Bonn, 1843, p. 244.

found as much among the children of the Malay and Japanese population as among those of the Europeans; Milroy,¹ Mackay, Huillet, Auboeuf and others speak in general terms of the occurrence of whooping-cough among the native children in India; as to its prevalence among the Chinese we have the information from Peking quoted above; in Egypt, Pruner has seen it in children of every colour; Bertherand among the Arab population of Algiers; Borchgrevink in Malagasy children; Quintin among the negroes of the Western Soudan; and the English practitioners among negro children in the West Indies. It has been universally prevalent among the native children in those islands of Polynesia that have had visitations of the malady; and it appears from the writings of Sigaud, Tschudi and others that the native races in South America have no immunity.

§ 17. AN EPIDEMIC MALADY.

Whooping-cough is pre-eminently an *epidemic disease*; that is to say, it is usually found in epidemic diffusion. Sporadic cases are met with for the most part as the precursors or stragglers of an epidemic, or in localities near to where the disease has been epidemic. The *duration* and the *area* of the epidemic depend essentially upon the number of persons susceptible to the action of the morbid cause; accordingly whooping-cough is more frequent and lasts longer in large and populous towns or in thickly populated districts, than in smaller places or in the more sparsely inhabited tracts of country. No doubt even in the latter the disease will sometimes last over a year, but only when it travels from place to place, coming back to the same locality after a brief interval of extinction. Of 156 epidemics, some of them confined to one place and others extending in wider circles, for which the dates of commencement and ending are accurately given, 16 lasted two months, 23 one month, 24 four months, 15 five months, 32 six months, 9 seven months, 7 eight months, 5 nine months, 7 ten months, 2 eleven months, and 16 a year or more.

¹ Transact. Epidem. Soc., 1865, ii, 156.

The area of diffusion which the disease has reached in the several epidemics has been as various as the duration in time. Very often it is limited to one place ; another time it spreads far and near over the country around ; not unfrequently it traverses great territories, and may even under certain circumstances acquire the character of a pandemic. Thus, in 1786 there was an epidemic of whooping-cough which spread from Southern Germany first to Istria, thence to Albania, and in another direction through Trieste, Muglia, Capo d'Istria and Isola to Venice ; from Venice it extended to Padua where it joined with an epidemic that had come from Savoy and had overrun the western part of Northern Italy. In 1785 whooping-cough was prevalent throughout the whole of Saxony and Franconia ; in 1813 in Carinthia and Styria, in 1814 and 1815 over most parts of Germany, in 1825-26 throughout the Danish mainland and islands ; in 1832 in Upper and Lower Austria and in Lombardy ; in 1850 over many parts of Louisiana ; in 1856 throughout the Netherlands ; and so on.

The recurrence of a whooping-cough epidemic at a given place has no more fixed date than has the return of any of the acute exanthemata.¹ Apart from the morbid cause acquiring new potency in one way or another, the return of the disease as an epidemic depends upon the presence of a sufficient number of persons capable of being affected by that which causes it ; and, inasmuch as the predisposition to the disease is nearly always removed by having had whooping-cough once, the recurrence of the epidemic in a locality will be the longer delayed, the more universally the last epidemic had prevailed.

¹ This is supported by the experience of Forbes for the Land's End ('Transact. of the Prov. Med. Assoc.,' 1836, iv, 171) ; of Goldschmidt for Oldenburg ('Häuser's Archiv,' 1845, vii, 303) ; of Förster for Dresden ('Zeitschr. für Kinderheilkde.,' 1866, n. s., i, 121) ; of von Franke for the quondam Duchy of Nassau ('Nass. med. Jahrb.,' 1863, xix and xx, 415) ; of Sozinsky for the United States ('Philad. Med. and Surg. Reporter,' 1881, Dec., p. 701) ; as well as of nearly all other observers.

§ 18. QUESTION OF IMPORTATION OR OF AUTOCHTHONOUS
ORIGIN.

All those characteristics of whooping-cough as regards time and place, which we have been considering, are of a kind to suggest that a *specific morbid poison* underlies its causation. But there is one fact in particular which fully bears out that conjecture, namely, that whooping-cough has among its other characters that of being exquisitely *communicable*. The evidence of this, apart from the innumerable well-authenticated single observations, is first and foremost the fact that in many regions having a very restricted commerce with the world beyond, such as Iceland, the Farøe Islands and Greenland, the outbreak of whooping-cough has always been associated with an importation of the disease; and that other countries, which had escaped the malady down to recent date, have become either the temporary or the permanent seats of it from the moment when individuals affected with whooping-cough landed on their shores.

From all that has been discovered hitherto, we are unable to decide when, where, and under what circumstances the specific virus took *origin*; whether, also, it does not go on being generated *de novo* even now, or whether the persistence of the disease on the great scale depends solely upon continuous transmission of that virus, upon unbroken contagion. It is at any rate perfectly certain that, if there be a *de novo* origin of whooping-cough at all, or an origin independent of transmission of the morbid poison (which is for the present unproven), that autochthonous origin of the disease is by no means co-extensive with its geographical distribution. This fact comes out most prominently in those countries, already spoken of, where whooping-cough has been met with only as a sequel of imported cases;—they remain exempt from it after the subsidence of the epidemic until such time as a new importation of the virus has taken place. But there is evidence of it also in those parts of the world, such as Australia, Polynesia and California, which had not been visited by whooping-cough until recent years, when the disease was brought to them from other lands and would

appear to have found in them the conditions favorable to its establishment. Chalmers¹ prefaces his account of the epidemic of 1759 in South Carolina with the noteworthy remark that whooping-cough is not indigenous to those parts, but had always been brought thither from other regions, that it had been epidemic only thrice within the last six-and-twenty years (his paper dates from 1776), and that twenty-one years had elapsed between the first and second epidemic and over five years between the second and third. Whether whooping-cough has become domesticated in South Carolina since that time does not appear from the later accounts of the malady there.

§ 19. THE MORBID POISON. COINCIDENCE WITH MEASLES.

We are as little able to form an opinion on the *nature of the morbid poison* as on the native habitat of the disease. The hypothesis that in whooping-cough we have to do with a *parasitic disease* may seem to be justified; at the same time, nothing definite has resulted from the inquiries started up to the present time.

Paulet² thought that he had found the cause of the disease in the bacteria of the air expired by whooping-cough patients, a discovery which American physicians were unable to confirm as regards the Pittsburg epidemic of 1868.³ Letzerich⁴ afterwards described a peculiar micrococcus-fungus, which is uniformly found, according to him, in the sputa of whooping-cough patients as well as on their respiratory mucous membranes; when it is transmitted to rabbits, it induces violent attacks of coughing and small spots of pneumonia and collapse in the lungs. Letzerich explains the occurrence of lobular pneumonia in patients with whooping-cough by the ascent of the micrococcus into the minute bronchi and

¹ 'Account of the Weather and Diseases of South Carolina,' 2 vols., Lond., 1776 (German transl., Stendal, 1796).

² 'Compt. rend. de l'Acad. des Sc.,' du 5 Août, 1867; 'Gaz. méd. de Paris,' 1867, 513.

³ In 'Transact. of the Pennsylv. State Med. Soc,' 1868.

⁴ In 'Virchow's Arch.,' 1870, Bd. 49, 530; 1873, Bd. 57, 518; 1874, Bd. 60, 409.

pulmonary alveoli. These observations were confirmed by Henke.¹ Tschamer also found, in the sputa of persons with whooping-cough, fungous elements which were identical with the moulds growing upon oranges, potato-skins and lemons (*Capnodium citri*). To prove that these were the same that produced the disease, Tschamer took the orange-mould and forcibly inhaled it; after which he suffered for ten days with attacks of cough that recurred three or four times a day; with the cough came an expectoration in which were found the same fungous elements as in the whooping-cough sputa.² Birch-Hirschfield,³ on the other hand, was unable to satisfy himself either of the uniform occurrence of Letzerich's micrococci in the sputa, or of the conveyance of the disease by the sputa to animals. Roszbach⁴ says that the micro-organisms found by Letzerich in the sputa and cultivated by him were moulds; and that he himself had never seen paroxysms of whooping-cough in rabbits after conveying to their tracheal mucous membrane the micrococci taken from the sputa of patients with whooping-cough.

Special importance for the pathogenesis has been attached to the fact that whooping-cough epidemics have *coincided remarkably often with epidemics of the exanthemata and of measles in particular*, or have preceded these, or followed them. It is impossible to decide whether that coincidence is to be referred merely to chance, or whether the two diseases have had something in common in their causation. However, the coincidence is not so uniform as to warrant the assumption of a "relationship" between the two diseases. In 495 whooping-cough epidemics, a coincidence with an epidemic of measles has been noted or adduced only 94 times; in 58 of these the diseases occurred together; in 11 whooping-cough preceded measles; and in 25 it came after.

¹ 'Arch. für klin. Med.,' 1874, xii, 630.

² 'Jahrb. für Kinderheilkde,' 1876, N. F. x., 174.

³ 'Centralztg. für Kinderheilkde,' 1878, i, 115.

⁴ 'Berl. klin. Wochenschr.,' 1880, 253.

CHAPTER IV.

CROUP.

§ 20. THE CONSEQUENCES OF AMBIGUOUS NOSOLOGICAL TERMS.

Nowhere in pathology more than in the doctrine of croup and diphtheria does the prejudicial effect of obscure or ambiguous terms for morbid conditions make itself obtrusively felt, especially when these are used by authors in more senses than one and from various points of view; and the disadvantage comes out, not only in making the writers unintelligible when they discuss each other's observations, but also in making it difficult to recognise and appraise the object itself. No doubt the efforts of men with a true insight have succeeded of late years in bringing order and clearness into the helpless chaos wherein the notions and views about these maladies and their relation to one another had lain in the earlier years of the century, a chaotic state which arose in no small measure from the almost total neglect to study the historical continuity of pathology. But despite these efforts we still meet with the old errors and misconceptions; and I think it incumbent on me, therefore, once more¹ to attempt, from the particular point of view which I take up in this work, to discuss somewhat more minutely than my task requires of me the question of the nature of croup and diphtheria, or, in other words, what is understood or should be understood under those terms, including the relation of the diseases to each other.

¹ Those who are acquainted with my account of this subject, and particularly with the discussion of disputed matters, in the former edition, will probably admit that I was right in the points of view which I put forward as most essential, although they were mostly got from the historico-pathological inquiry, and only to a very small extent based upon observations of my own. That was more than twenty years ago, and at a time when the doctrine of croup and diphtheria was still in a chaos of misunderstanding. My position was the specific infective

§ 21. REFERENCES TO CROUP IN OLD AUTHORS.

Under the name of *κυνάγχη* were included by the oldest Greek physicians¹ (whose writings are preserved in the Hippocratic collection) all those forms of disease in the neck² and in the organs there situated, which were characterised by difficulty in swallowing and by dyspnœa rising to the point of suffocation. On the other hand the physicians of the later period of Greek medicine distinguished four forms of the malady (although Galen³ speaks of the subdivision as needless) namely, *κυνάγχη* or *παράκυνάγχη*, according as the disease was seated in the larynx or in the parts about it; and *συνάγχη* or *παρασυνάγχη* according as it was in the pharynx or in the tissues around.⁴ In the writings of the Roman physicians,⁵ the word corresponding to the old Greek term *κυνάγχη*, and nearly related to it in etymology, is *angina*; and that term continued to be used in the same sense⁶ throughout the whole of the middle ages and as far through the modern period as the end of last century, the later writers distinguishing an "angina catarrhalis," "inflammatoria," "convulsiva," and the like, according to the character of the disease, and an "angina uvularis," "tonsillaris," "pharyngea," and "laryngea," according to its seat.⁷

nature of diphtheria (angina maligna) as contrasted with croup, the pathogenesis of which I referred to causes that produce chill; while the various forms of the diphtheritic process were indicated as the simple catarrhal, the fibrinous, and that tending to necrosis.

¹ See 'Prognostikon,' § 23, ed. Littré ii, 176; 'Epidemiorum,' lib. iii, ægr. vi, ed. cit. iii, 52; 'De morbis,' lib. ii, § 9, 26-28, ed. cit. vii, 16, 40, 42, 46.

² Including even the dysphagia and dyspnœa that occurred with dislocation of the cervical vertebrae (See 'Epidem.,' lib. ii, sect. ii, § 24, ed. cit. v, 94.

³ In 'Comment. III in Hippokr. Prognostikon,' § 18, ed. Kühn, xviii B., 267, he says that it is only an affair of names: "*σκαῖόν ἐστι τὸ περὶ τῶν οὐρομάρων ἐπιζῆν.*"

⁴ See particularly Alexander of Tralles, lib. iv, cap. i, ed. Basil, 1556, p. 219; and Paulus, lib. iii, cap. xxvii, ed. Lugd., 1551, p. 173.

⁵ See Celsus, lib. iv, cap. iv; and Caelius Aurelianus, 'De morbis acutis,' lib. iii, cap. i-iv, ed. Amstelodami, 1755, p. 179.

⁶ This is the explanation of Heberden's use of the term "angina pectoris" as applied to stenocardia in his well-known original account of it in the 'Medical Transactions of the College of Physicians,' Lond., 1772, ii, 59.

⁷ Among others Boerhaave, and his commentator Van Swieten, "Comment. in Boerhaavii aphorismos," ii, 618.

It stands to reason that the severe forms of inflammation of the laryngeal mucous membrane, and croup in particular, must have been included under the comprehensive notion of *κρυάγχη* and *angina*; and the same holds, in part at least, for those cases of *κρυάγχη* in which, although the examination of the neck and pharynx revealed no morbid changes, the course of the disease was most rapidly fatal (in from twenty-four hours to four days),¹ and laryngotomy recommended as the last resource.²

From the symptoms of disease, as they are described, we are certainly unable to draw any safe conclusion;³ but the statement that it was precisely in children that the severe forms of the *κρυάγχη* were rarest,⁴ would seem to warrant the inference that the Greek and Roman physicians, practising as they did in warm countries, had few opportunities of seeing genuine croup.

The first authentic account of croup occurs in the history of the sickness of the year 1576 in Paris, by Baillou,⁵ who mentions croup as occurring secondary to measles, as well as sporadic cases of genuine croup during an epidemic of

¹ See Hippocrates, 'Prognostikon,' l. c.; Galen, 'Introductio,' cap. xiii, ed. cit. xiv, 733-4; as well as the later Greek writers.

² The first to recommend laryngotomy (it is doubtful whether he practised it) in cases of suffocation from *κρυάγχη*, was Asclepiades (compare Galen, 'Introductio,' l. c., and Caelius Aurelianus, l. c.). The operation was afterwards practised by Antyllus, in the manner described by Paulus (lib. vi, cap. xxxiii, ed. cit., p. 383). An opinion unfavorable to laryngotomy is pronounced by Aretaeus ('De curat. acut. morbor.,' lib. i, cap. vii), and by Caelius Aurelianus (*i. e.* Soranus), who says: "Est fabulosa arteriae ob respirationem divisura, quam laryngotomiam vocant, et quae a nullo sit antiquorum tradita, sed caduca atque temeraria Asklepiadis inventionem affirmatur." The Arabians also pronounce laryngotomy to be a quite unjustifiable procedure: such as Rhazes ('Continens,' lib. iii, cap. vii, Brixiae fol. k. iii), who speaks of a Greek practitioner, Ancilisius (it should probably be Antyllus), who had done the operation; Avicenna, 'Canon,' lib. iii, feu. ix, Tract. i, cap. xi, ed. Venet., 1564, i, 610; and Abulkasim ('Chirurgia,' lib. ii, cap. xliii cur. Channing, Oxon., 1778, i, 227), who says that the older physicians (*i. e.* the Greeks) had certainly recommended laryngotomy, but that he knew of no one in his own country who had practised the operation.

³ The single statement that can perhaps be taken as having a direct reference to croup occurs in one of Galen's writings, where he speaks of a certain "adolescentulus qui tussiendo tunicam crassam viscosamque exspuerat."

⁴ "Afficiuntur autem hac passione," says Caelius Aurelianus, "magis viri quam mulieres, quorum plus aetatis mediae et juvenes, quam pueri atque senes."

⁵ 'Epidem.,' lib. ii, "Const. hiemalis anni 1576," Annot., § 7, op. Genev., 1762, i, 148.

whooping-cough. "Filius D. le Noir," we read in this passage, "ista difficultate spirandi interiit, quum raucedinem quandam haberet caninam et tumentes paulum fauces. Gervasus Honoré, socer meus, ita paene suffocatus interiit. Chirurgus affirmavit, se secuisse cadaver pueri ista difficili spiratione, et morbo (ut dixi) incognito¹ sublato; *inventa est pituita lenta, contumax, quae instar membranae cujusdam arteriae asperae erat oblenta, ut non esset liber exitus et introitus spiritui externo*: sic suffocatio repentina." After this we find clear descriptions of croup by Fabricius van Hilden,² Ettmüller,³ Blair⁴ and other writers of the seventeenth and eighteenth centuries, under the name of "catarrhus suffocativus" (which no doubt included other forms of disease). At length we come to Francis Home,⁵ whose work on croup is fundamental. He characterises the disease as a peculiar and hitherto unknown form of catarrhus suffocativus, and gives it the name of "suffocatio stridula." Its peculiar nature consists, according to him, in an inflammation of the laryngeal and tracheal mucous membrane, followed by a mucous exudation which under certain circumstances coagulates to a "white, soft, thick præternatural coat or membrane;" he had seen the latter coughed up during a paroxysm in the form of a false membrane, and he had also met with it *post mortem* adhering to the mucous membrane of the larynx and trachea, and sometimes even far into the bronchi. According to his observations, Home distinguishes an inflammatory or catarrhal form, less dangerous, and a purulent or membranous form, very dangerous, which he regards as different stages of the disease. Of both forms he gives several clinical histories. Further, he expressly states that the mucous membrane of the pharynx is not at all involved, or merely reddened slightly in some cases, the tonsils also being somewhat swollen. The disease occurred mostly during the prevalence of cold and wet weather and in the

¹ That is to say, this peculiar affection of the larynx, and the cause that led to the patient's death, were quite unknown before.

² 'Observ. Chirurg.,' cent. iii, obs. x, Lugd. 1641, i, 354.

³ Op. Lugd., 1685, iii. 163.

⁴ 'Observ. in the Practice of Physic,' Lond., 1718, p. 92.

⁵ 'Inquiry into the Nature, Cause and Cure of the Croup,' Edin., 1765. (German edition, Bremen 1809.)

coast districts, sometimes also as a secondary affection in the course of smallpox, measles and whooping-cough.

This work of Home's, which was received with the liveliest interest in the medical world, was followed by writings on the same subject by Albers, Jurine, Vieusseux and others; these were sent in as competitive essays for the prize offered by Napoleon, the two first-mentioned having been crowned with the award. There were also the works of Royer-Collard, Valentin, Double, Guersant and others, which together served to fill in details of the disease described by Home, without opening up any really new point of view; in them, however, the "false membrane" came more and more to the front as the essential characteristic of croup; the catarrhal form, which these writers were by no means unacquainted with, disappeared more and more from the clinical conception of croup that Home had so correctly worked out; so much so that Guersant found himself driven to contrast those cases in which the formation of a false membrane had not been reached or was not apparent, with the proper or membranous croup, giving the former the name of "pseudo-croup." At length, on the appearance of Bretonneau's treatise on "Diphtherite," a new era began not only for the doctrine of croup but for that of the forms of inflammation in mucous membranes generally, importing with it, however, a new terminology, and confusion of anatomical, etiological and clinical notions into the discussion of the subject-matter, and therewith introducing erroneous doctrinal conceptions and misunderstandings which, as we have already remarked, are not even yet got rid of. For that result, however, Bretonneau himself can be held answerable only to a very small extent. I shall enter into further particulars on this matter by way of pre-facing the history of angina maligna (diphtheritis of the throat) in the chapter that follows this.

§ 22. SENSES IN WHICH CROUP MAY BE UNDERSTOOD.

From the clinical point of view, then, I understand by croup¹ severe forms of laryngitis, whose anatomical basis is an inflammatory process either of a catarrhal or of a fibrinous character. In consequence of narrowing of the glottis, which itself depends on the exudation, or on a swollen state of the mucous covering of the vocal cords, or on spasmodic contraction of the laryngeal muscles, or on more than one of these factors together, there ensue paroxysms of suffocation; and these come on all the sooner and all the more severely the narrower the glottis is naturally (as during the age of childhood), and the more firmly the fibrinous exudation clings to the mucous membrane. Both forms of croup, with their different anatomical characters (catarrhal and fibrinous), may be excited by a variety of causes; one and the same etiological factor may produce a catarrhal croup in one person and a fibrinous in another, according to the intensity of its action, or to the individuality of the person attacked, or to other accessory circumstances of the same kind. The disease occurs in either of two ways:

(1) As an independent malady (true croup), either in consequence of the effect of irritants acting chemically or thermically²—a class of cases so rare that we may disregard them in our inquiry upon the pathogenesis in ordinary and on the great scale—or in consequence of harmful meteorological conditions.

(2) As a concomitant (secondary or infective croup) of other forms of disease, particularly the infective, such as

¹ The popular term "croup," which had been previously used in the form of "croops," in the above-quoted work by Patrick Blair, is probably derived, as Wilson conjectures ('Edin. Med. Journal,' 1856, Feb., p. 675), from a root that occurs under various modifications in all the Teutonic languages; thus, "hrop" in Icelandic, "hrepan" in Anglo-Saxon, "hropjan" in Gothic, "hrof" in old German, and "geroep" in low Dutch. It signifies in them all "geruf," or cry, a hoarse or crowing note with inspiration.

² On the artificial production of fibrinous croup in animals by means of chemical irritants, see the writings of Albers (p. 100), Royer-Collard (p. 166 in the German transl.), Bretonneau (p. 355), Delafond ('Gaz. hebdom. de méd.,' 1859, p. 24), Reitz ('Wiener Sitzungsber.,' 1867, Abth. iii), Trendelenburg ('Arch. für klin. Chirurgie,' 1869, x, 720), and Oertel ('Arch. für klin. Med.,' 1874, xiv, 202).

typhus, measles, scarlet fever, smallpox, whooping-cough, and, above all, angina maligna (diphtheria).

What follows relates only to true croup; and I must expressly state that, out of the large number of observations on the matter, wherein croup and angina maligna are often inextricably mixed up, I have made use only of those which can be taken with absolute certainty, or at least with a high degree of probability, as relating to that particular form of disease.

§ 23. PRESENT AREA OF PREVALENCE.

The acute inflammatory affections of the laryngeal mucous membrane generally go with the acute catarrhal affection of the bronchial mucosa in their *distribution over the surface of the globe*; only that the prevalence of the former in high latitudes, contrasting with their scarcity in the warm and equatorial zones, is much more decided than in the case of acute bronchial catarrh. The principal seats of the disease are the northern and temperate latitudes both of the Eastern and Western hemispheres¹. It is particularly common in *Iceland*,² in the northern and central districts of *Sweden*,³ including the counties of Dahlsland and Wermland around the shores of Lake Wener (truly endemic in the districts of Näsäräd and Amäl where the By-elf flows into the lake), also in many parts of *Finland*,⁴ such as Iakobstadt occupying a low and damp situation on the Gulf of Bothnia, and in the northern governments of *Russia*, particularly the Baltic Provinces.

¹ Comparative statistics of the amount of the sickness in the several districts of its distribution-area are not to be had; inasmuch as the figures relate solely to recent years, and in most returns the figures for croup and for diphtheria (angina maligna) are purposely thrown together; while in others it does not appear whether the data under the head of "croup" do indeed relate exclusively to that disease.

² Schleisner, 'Island undersøgt fra et laegevidenskabel Synspunkt,' Kjöbenh., 1849, S. 49; accounts in 'Bibl. for Laeger,' 1839, i, 124. 1840, i, 73; in 'Sundhetsköll. Forhandl. for Aaret, 1850,' 28; Finsen, 'Jagttagelser angaaende Sygdomsforholdene i Island,' Kjöbenh., 1874, 44.

³ Accounts in 'Svenska Läkare Sällsk. Handl.,' 1825, x, 115; Huss, 'Om Sverges endem. Sjukdomar,' Stockh., 1852, 37; Berg, 'Bidrag till Sveriges med. Topogr. och Statistik,' Stockh., 1853, 57, 94.

⁴ Fontell, 'Finska Läkare Sällsk., Handl.,' ii, Nr. 1.

In *Denmark*¹ and *North Germany* the severe forms of laryngitis occur comparatively often, both in the coast districts, whence we have numerous accounts of its prevalence in Greifswald,² Mecklenburg,³ Hamburg,⁴ Holstein,⁵ Bremen,⁶ Emden,⁷ and other places, and in inland territories such as East Prussia,⁸ Breslau,⁹ Saxony,¹⁰ Westphalia,¹¹ the Rhine country,¹² and Alsace.¹³ Croup is found not unfrequently also in parts of *South Germany*, such as Nassau,¹⁴ the Upper Rhine,¹⁵ many places in Württemberg,¹⁶ Sigmaringen,¹⁷ the Odenwald,¹⁸ Lower Austria¹⁹ (e. g. Vienna), Salzburg,²⁰ and Styria.²¹ The same is true of many localities in Switzerland²²

¹ Otto, 'Transact. of the Prov. Med. Assoc.' 1839, vii, 204, and many references in the sanitary reports of Danish practitioners in 'Sundhedskoll. Forhandl.'

² Stubenrauch, 'De angina membranacea,' Gryph., 1845.

³ Sachse, 'Das Wissenswürdigste von der häutigen Bräune,' Lübeck, 1810, i, 184; Wächter, ib., 224.

⁴ Wigand, 'Allgem. med. Annal.,' 1802, 'Correspondenzbl.,' 58; Zimmermann, in 'Hufeland's Journ.,' lxx, 1830, März, 108.

⁵ Gutfeldt in 'Horn's Arch. für med. Erfahr.,' 1808, viii, 69; Marxsen in 'Pfaff's Mittheil. aus dem Geb. der Med.,' 1835, N. F., i, Heft 5, S. 1; Hermes, ib. 1836, ii, Heft 3, 88.

⁶ Heineken, 'Die freie Hansestadt Bremen, &c.,' ii; Lorent, 'Jahresberichte über den Gesundheitszustand in Bremen,' Jahrg. i.

⁷ Gittermann in 'Hufeland's Journal,' lxi, 1829, Oct., 3.

⁸ Lietzan, 'Sanitätsber. des Medicinal-Colleg. von Königsberg,' 1842, i, 12.

⁹ Graetzer, l. c.

¹⁰ 'Physikatsberichte aus dem Königreich Sachsen.'

¹¹ Sibergundi, 'Rhein. Jahrb. für med.,' Suppl., ii, 18; references in the 'Sanitätsber. der Provinz Westfalen.'

¹² Many accounts in the 'Sanitätsberichte des Rhein. Medicinal-Collegiums.'

¹³ Foderé, 'Leçons sur les épidémies, &c.,' Par., 1824, iii, 106; Meyer, 'Ober-Ehnheim in med. topogr. Hinsicht,' Strassb., 1841.

¹⁴ 'Nass. med. Jahrb.,' 1863, Heft 19 and 20, 412.

¹⁵ Kopp, 'Beobacht. im Geb. der Heilkde,' 1821, 5; Pauli, 'Med. Statistik der Stadt Landau,' Land., 1831, 172.

¹⁶ Eschenmayer, 'Die Epidemie des Croups zu Kirchheim,' Stuttg., 1812; Autenrieth, 'Versuche, &c.,' Tübing., 1817, 13; Heyfelder, 'Studien im Geb. der Heilwissenschaft,' ii, 161; various papers in the 'Württemb. med. Correspondenzbl.,' —Lebküchner, i, 172; Dürr, iii, 135; Rösch, vii, 387; Enz, viii, 283; Cammerer, x, 6, and xvii, 57, and others.

¹⁷ Heyfelder in 'Schmidt's Jahrb.,' 1838, xi, 232.

¹⁸ Ebel in 'Hufeland's Journ.,' xc, 1840, Juni, 102.

¹⁹ Gölis, 'Tract. de angina membranacea,' Vienn., 1813; Knolz, 'Oesterr. med. Jahrb.,' Nst. F., xvii, 6.

²⁰ Stroinz, ib., i, Heft 4, 46; Aberle, ib. 1843, März, 302.

²¹ Weiglein, ib., 1842, Feb., 132.

²² See Jurino, 'Abhandl. über den Croup,' from the French, L₂ x. 1816, 182;

—St. Gall, Zürich, Bern, Neuchatel, Yverdon, Lausanne and Geneva.

The severe forms of laryngitis are as common in many parts of Great Britain and Ireland as they are in the countries bordering the Baltic and North Sea already mentioned. In *England and Wales* the average mortality from croup over three years (1853-1855), among children under eleven years of age, amounted to 2·1 per cent. of the deaths from all causes within that period of life; in Wales it rose to 3·6 per cent., in the North-Western counties to 2·7, in the South-Western and in the Northern Midland counties it stood at the mean, in the Western Midland and the Northern counties it was 1·9, in Yorkshire and the South-Eastern counties 1·8, in London 1·7, and in the Southern Midland counties and the Eastern counties 1·6 per cent. Individual observations confirmatory of the prevalence of croup in Wales and the Northern and South-Western counties are published for Swansea,¹ York,² Westmoreland,³ Devonshire,⁴ Cornwall,⁵ and other localities; on the other hand the rarity of croup in Cambridgeshire has been asserted (1809) by Royston,⁶ who says that a surgeon in large practice there had seen only two cases of it during a period of twenty years. In *Scotland*, where Crawford⁷ had long ago called attention to the general diffusion and frequent occurrence of croup, the principal seats of it are the coast of Fife, Ayrshire, Galloway, the eastern division of Perthshire, and East Lothian;⁸ whereas in Edinburgh⁹ and in the interior¹⁰ of the country it is much less common. In *Ireland* also, croup is very widely

Vieussens, 'Journ. de méd.,' 1806, Mai, 568; Hegetschweiler, 'Schweiz. Arch. für Med.,' Heft 4, 194; Engelhard, 'Der Croup in dreifacher Form, &c.,' Zürich, 1828; 'Berichte des Züricher Gesundheitsrathes,' *passim*.

¹ Collins, 'London Med. Repository,' 1815, Aug., 101.

² Wintringham, 'Commentr. nosologica,' &c., German ed., Berol., 1791, 97.

³ Bayers, 'Edinb. Med. and Surg. Journ.,' 1824, Oct., 325.

⁴ Shapter, 'The Climate of the South of Devon,' &c., Lond., 1842.

⁵ Forbes, 'Transact. of the Provincial Med. Assoc.,' 1836, iv, 172.

⁶ 'Lond. Med. and Phys. Journ.,' 1809, Jan., p. 97.

⁷ 'Diss. de Cynanche stridula,' Edin., 1771.

⁸ Alison, 'Lancet,' 1841-42, i, 854.

Robertson, 'Lond. Med. and Phys. Journ.,' 1808, Feb., p. 184; 1810, Sept.,

spread and very frequent,¹ particularly in the country districts, where the mortality from the disease stands to that in the towns in the ratio of 40 to 27.

In *Holland*² croup counts among the more common affections; also in the northern parts of France, such as Brittany, Normandy, Picardy, Lorraine,³ as well as in Bell-île-en-mer⁴ (and in Jersey⁵). In the southern departments of France, these severe forms of laryngitis are much rarer, so much so that Fodéré⁶ during a twenty years' practice (mostly on the Mediterranean coast) did not chance to meet with a single case; in the canton of Dax (Dept. Landes), the disease is very rarely seen,⁷ while in Lyons and Toulouse it is more common.⁸ Still more marked is the small amount of the malady in *Italy* as compared with the northern countries of Europe. Nearly all the observers express themselves to the same effect as regards the rarity of croup there: thus we read in the 'Repertorio med. chir. di Torino,' à propos of a paper by Bofanno on several cases of croup which he had seen at Nice, that the malady is extremely rare in Turin; the same is true of the province of Sondrio,¹⁰ of Leghorn,¹¹ and of Venice;¹² in Pavia during six years (1791-96) Frank saw only one case,¹³ and only a single case happened to Berard in Rome during a practice of fourteen years.¹⁴ It would appear to be somewhat more common in the valleys of Piedmont,¹⁵ at Civita Vecchia,¹⁶ at Milan,¹⁷ and in some other

¹ Wylde, 'Edin. Med. and Surg. Journ.,' 1845, April, p. 257.

² Thijssen, 'Geschiedkundig Beschouwing der Ziekten in de Nederlanden,' Amsterd., 1824.

³ Simonin, 'Recherch. topogr. et méd. sur Nancy,' Nancy, 1854, p. 175.

⁴ Cabrol, 'Mém. de méd. milit.,' 1850, deux. sér., vi, 51.

⁵ Hooper, 'Observ. on the Topography of Jersey,' Lond., 1837. ⁶ L. c.

⁷ Laville, 'Essai sur la topogr. méd. . . du canton de Dax,' Paris, 1879, p. 118.

⁸ Gaussail, 'Journ. de méd. de Toulouse,' 1845, Sept.

⁹ For the year 1825, p. 378.

¹⁰ Balardini, 'Topogr. stat-med. della provincia di Sondrio,' Milano, 1834, p. 63.

¹¹ Palloni, 'Sulla costituzione epidemica . . . di Livorno,' Liv., 1827.

¹² Taussig, 'Venedig von Seiten seiner klimatischen Verhältnisse,' Vened., 1847, p. 75.

¹³ 'Acta instituti clin. Vlnensis,' Ann. iii—v, p. 55.

¹⁴ 'Journ. des connoiss. méd.-chir.,' 1847, Nov., p. 200.

¹⁵ Valentin, 'Recherch. hist. et prat. sur le croup,' Paris, 1812, p. 35; and Voyage méd. en Italie, Nancy, 1822, p. 163.

¹⁶ Girolami, 'Consider. sopra il clima di Civita-Vecchia,' Firenze, 1842.

¹⁷ Garavaglia, 'Gaz. med. di Milano,' 1847, No. 49.

localities; but even in these it is characterised by a remarkably mild type (laryngitis catarrhalis). The statement of Rigler¹ that croup is frequent in Constantinople and other parts of *Turkey*, is contradicted by the more recent observations of Marrion.² In Greece the cases observed of it have been rare, to say the least.³

From the western regions of Asia we have no information about croup, except that Post⁴ speaks of it as almost unknown in *Syria*. The same holds good for the greater part of *India* and the *Malay Archipelago*, and for the Southern and South-Western coasts of *China*.⁵ In elevated and mountainous parts of India, many cases of the severe forms of laryngitis occur, especially in localities subject to trying weather influences,⁶ such as districts of the Himalayan slope situated at elevations of 6000 to 7000 feet (2000 metres),⁷ and the mountainous parts of the Deccan.⁸ In the East Indies, also, where croup is for the most part unknown,⁹ it is found to be prevalent in damp localities subject to an extreme range of temperature.¹⁰ The disease is met with more commonly in *Japan*,¹¹ in the *Hawaiian Islands*,¹² on the southern coast of *Australia* (in Victoria¹³ and at Sydney¹⁴), on the coast of *Tasmania*¹⁵ (Hobart) and in *New Zealand*.

The silence of nearly all medical authorities for the equa-

¹ * Die Türkei und deren Bewohner,' ii, 220.

² * Arch. de méd. nav.,' 1869, Dec.

³ Olympios, 'Correspondenzbl. bayerischer Aerzte,' 1840, p. 181.

⁴ * New York Med. Record,' 1868, June, 149.

⁵ Hobson, 'Med. Times and Gaz.,' 1860, Nov., 478.

⁶ Gordon, ib., 1856, Aug., 188.

⁷ Farquhar, 'Indian Annals of Med. Sc.,' 1863, Apr., 441; Francis, ib., 1860, Novbr., 9.

⁸ Shanks ('Madras Quart. Med. Journ.,' 1842, iv, 302) records the occurrence of croup among the native children in Secunderabad.

⁹ Heymann ('Verhandl. der Würzburger phys.-med. Gesellsch.,' 1859, ix, S. xli) saw no case of croup in the East Indies during a residence of twenty years; v. d. Burg ('De Geneesher in Nederlandsch Indie,' Batav., 1882, i, 299), writing from the same part of the world, says: "Croup wordt nimmer gezien."

¹⁰ v. Leent, 'Arch. de méd. nav.,' 1867, Septbr., 171.

¹¹ Simmons, 'New York Med. Record,' 1881, Jan., 91.

¹² Chapin, 'Amer. Journ. of Med. Sc.,' 1837, May, 43; Gulick, 'New York Journ. of Med.,' 1855, March.

¹³ Richardson, 'Edinb. Med. Journ.,' 1869, March, 802.

¹⁴ Bourse, 'Arch. de méd. nav.,' 1876, Mars, 165.

¹⁵ Hall, 'Transact. of the Epidemiol. Soc.,' 1865, ii, 74.

torial countries of Africa concerning croup leaves us to infer that the disease is at all events very rare there; we have a positive statement to that effect by Chassaniol¹ for *Senegambia*; Borchgrevink's² information that croup is found somewhat frequently in *Madagascar* should be taken, it would seem, as relating to the secondary laryngeal affection in angina maligna (diphtheritis of the throat). In *Egypt* Pruner³ saw croup almost exclusively in children of the Caucasian race; for Kabylia (*Algiers*) Bazille⁴ absolutely denies that the malady exists; from the *Cape* we have no accounts of it; but in the southern parts of *Central Africa* it would appear from Livingstone's statement to be common.

In the Western Hemisphere, the chief seats of croup are the northern and middle regions of the *North Atlantic coast-belt*, including Canada, New Hampshire,⁵ Massachusetts,⁶ New York,⁷ Pennsylvania⁸ and Maryland,⁹ as well as the northern and central latitudes of the Mississippi valley.¹⁰ On the west coast *Alaska*¹¹ is a principal seat, and also *California*,¹² according to Gibbons, who does not agree with earlier observers.

In the equatorial and sub-tropical regions of the American continent, croup is just as rare as in the corresponding latitudes of the Old World. In the *West Indies* there have been a few cases seen in Jamaica by Lemprière,¹³ Mason,¹⁴

¹ 'Arch. de med. nav.,' 1865, Mai, 510.

² 'Norsk. Magaz. for Laegevidenskaben,' 1872, iii, Raekke, ii, 234.

³ 'Die Krank. des Orients,' 284.

⁴ 'Gaz. méd. de l'Algérie,' 1868, 29.

⁵ Spalding, 'Lond. Med. and Phys. Journ.,' 1807, Jan., 38.

⁶ Porter, 'New England Journ. of Med.,' 1819, viii, 387; Curtis, 'Transact. of the Amer. Med. Assoc.,' 1848, ii, 487.

⁷ Niles and Russ, 'Medical Statistics,' &c., New York, 1827; Dannel, 'Amer. Journ. of Med. Sc.,' 1838, May, 243; Swett, 'Treatise on Diseases of the Chest,' &c., New York, 1852.

⁸ Emerson, 'Amer. Journ. of Med. Sc.,' 1827, Nov., 116; 1831, Nov., 17, 1848, July, 13; Jewell, ib., 1859, April, 391 (relating to Philadelphia).

⁹ Archer, 'On Cynanche Trachealis,' Diss., Philad., 1798; Joynes, 'Amer. Journ. of Med. Sc.,' 1850, Oct., 297; Frick, ib., 1855, Oct., 312 (relating to Baltimore).

¹⁰ Drake, 'Treatise on the Principal Diseases of the Interior Valley of North America,' Philad., 1854, ii, 819.

¹¹ Blaschke, 'Topogr. med. portus Novi-Archangelensis,' Petrop., 1842, 68.

¹² 'Annual Address before the San Francisco Med. Society,' 1857.

¹³ 'Pract. Obs. on Diseases . . . in Jamaica,' Lond, 1799, i, 46.

¹⁴ 'Lond. Med. Repository,' 1825, Aug., p. 169.

and others; the authorities, such as Levacher, for other West Indian Islands, make no mention of it; while in Martinique¹ and St. Martin² it is said to be rather frequent. In *Central America* (Nicaragua³ and Guatemala⁴) the disease would appear to be quite unknown, or at least very rare. In the medico-topographical and other nosological writings from *Guiana* and *Brazil*, I do not find a single reference to croup. In *Peru* it hardly occurs at all on the coast or in the warmer valleys; but it is somewhat more common on the Cerro Pasco and in other parts of the sierra region;⁵ and the same holds for *Chili*. In the *River Plate States*, again, it is met with to the same extent as in the corresponding latitudes of the Northern Hemisphere.⁶

§ 24. ALLEGED INCREASE IN RECENT TIMES.

Many of the earliest writers who recognised croup by its distinctive characters, such as Alexander,⁷ Lentin,⁸ Goelis,⁹ Eschenmeyer,¹⁰ Schäffer,¹¹ Wallich,¹² Vieusseux,¹³ Joseph Frank,¹⁴ Schmidtman,¹⁵ and Royer-Collard,¹⁶ were of opinion that the disease had *increased considerably within modern and recent times*. But that must appear doubtful when we bear in mind the following things: that in this, as in many other diseases, the number of cases has risen just

¹ Rufz, 'Arch. de méd. nav.,' 1869, Juin, p. 430.

² Hamon-Dufougery, ib., 1883, Janv., p. 57.

³ 'Deutsche Klinik,' 1854, No. 10.

⁴ Bernoulli, 'Schweiz. med. Zeitschr.,' 1864, iii, 100.

⁵ See Tschudi, 'Ester. med. Wochenschr.,' 1846, p. 446; Smith, 'Edin. Med. and Surg. Journ.,' 1842, Apr., p. 360.

⁶ 'Observ. topogr. et méd. faites dans le Rio-de-la-Plata,' Paris, 1842, p. 36.

⁷ 'Treatise on the Nature and Cure of the Cynanche trachealis,' Huddersfield, 1794, p. 5.

⁸ 'Beiträge zur ausübenden Arzneiwissenschaft,' Leipz., 1797, i, 344.

⁹ L. c., p. 4.

¹⁰ 'Die Epidemie des Croups zu Kirchheim,' Stuttg., 1812, p. 22.

¹¹ 'Horn's Arch. für med. Erfahr.,' 1811, Juli—Aug., p. 152.

¹² 'Allg. med. Annal.,' 1812, Oct., p. 943.

¹³ L. c., p. 62.

¹⁴ 'Acta inst. clin. Vilmensis,' l. c.

¹⁵ 'Summa observ. med.,' Berol., 1812, ii, 24.

¹⁶ L. c., p. 152.

in proportion as practitioners have directed their attention to it; that at all events the bills of mortality for past times, which should be the real basis for any such opinion, can by no means suffice to decide the matter; that the increase in question had been probably only a temporary and periodical rise in the number of cases; and that angina maligna (diphtheritis of the throat) has often been confounded with croup. At the same time it may be granted that many changes in the upbringing of children, such, for example, as the greater coddling and cockering of them among the better-off classes, may have increased the predisposition to take croup at that time of life.

§ 25. SO-CALLED EPIDEMICS OF CROUP.

It is the periodical rise in the number of cases of croup, just referred to, that has given origin to the idea of its occurrence in *epidemics*.

Of the so-called epidemics of croup we have numerous accounts,¹ of which the following is a chronological list: 1728 York,² 1758 Heilbronn,³ 1761 Göttingen,⁴ 1798 Gräfenenthal,⁵ 1801 Hamburg,⁶ 1804 Altona⁷ and Portsmouth,⁸ New Hampshire, 1805 Würzburg,⁹ 1807 Tübingen, Kirchheim and other places in Würtemberg,¹⁰ 1807-8 Ratzeburg¹¹ and Vienna,¹² 1809-10 Edinburgh,¹³ 1810 Plainfield,¹⁴ Mass., 1811 Waida,¹⁵ 1812 Baireuth,¹⁶ 1822 and 1823 various parts of Sweden,¹⁷ 1823

¹ Those epidemics in which croup had occurred secondarily in the course of diphtheria are naturally left out of account in this enumeration.

² Wintringham, l. c.

³ Weber, 'Observ. Med. Select.,' 1776, 32.

⁴ Riepenhausen, 'Morbi epidemici,' &c., Hall., 1766, 28.

⁵ Winkler, 'Med. National-ztg.,' 1799, 206.

⁶ Wigand, l. c.

⁷ Gutfeldt, l. c.

⁸ Spalding, l. c.

⁹ Horsch, 'Annalen der klin. Schule,' Heft ii.

¹⁰ Autenrieth, Eschenmayer, ll. cc.

¹¹ Wächter, l. c.

¹² Gölis, l. c.; Friedländer, 'Bullet. de l'école de méd. de Paris,' 1808, 50.

¹³ Robertson, l. c.

¹⁴ Porter, l. c.

¹⁵ Kühn, 'Annal. der Heilkunst,' 1812, 533.

¹⁶ Sackenreuter, ib., 1812, 737.

¹⁷ Accounts in 'Svenak. Läk. Sällsk. Hdl.,' x, 115.

Copenhagen,¹ 1824 Salzburg,² 1834 Tuttlingen,³ 1835 Wadowice,⁴ several parts of Rhenish Prussia⁵ and Sigmaringen,⁶ 1836-37 Schwenningen,⁷ 1837 Canton Zürich,⁸ 1839 county of Veile⁹ (Denmark), 1840 Voigtsberg¹⁰ (Saxony), 1842 East Prussia,¹¹ 1844 Gemünd¹² and some parts of Denmark,¹³ 1884-45 Greifswald,¹⁴ 1845 several places in Rhenish Prussia,¹⁵ 1847 and 1853 Nassau,¹⁶ 1848 Luneville,¹⁷ 1852 Copenhagen,¹⁸ 1852-53 several places in Würtemberg,¹⁹ 1853 the Palatinate,²⁰ 1855 the vicinity of Graben²¹ (Baden), 1856 the Enyinger²² district of Hungary, 1857, 1858, and 1860, various places in Sweden,²³ and 1858 Iceland.²⁴

In these and other instances of a like kind we have to do merely with a concurrence of numerous cases of croup at a particular place or in a particular district, and under the influence as we shall see, of the same meteorological conditions which so often bring about the more general prevalence of bronchial catarrhs, slight or severe. But we are as little warranted in the one case as in the other in speaking of an "epidemic" in the ordinary sense of the term. Formey²⁵ had previously shown that there was no such thing as an epidemic of croup; Guersant had expressed himself to the

¹ Bang, 'Nye Hygeen,' i, 232.

² Aberle, 'Oester. med. Jahrb.,' 1843, März, 302.

³ Heyfelder, 'Studien,' l. c.

⁴ Rohrer, 'Oester. med. Jahrb.,' 1845, Sept., 354.

⁵ 'Rhein. Sanitätsber.,' 1835, 38.

⁶ Heyfelder in 'Schmidt's Jahrb.,' l. c.

⁷ Rösch, l. c.

⁸ 'Bericht des Züricher Gesundheitsrathes f. d. Jahr 1837,' 108.

⁹ Account in 'Bibl. for Laeger,' 1841, ii, 360.

¹⁰ 'Physikatsbericht des Königr. Sachsen für die Jahre 1840 und 1841,' 20.

¹¹ Lietzau, l. c.

¹² 'Rhein. Sanitätsber. f. d. Jahr 1844,' 23.

¹³ 'Sundhedskoll. Forhandl.,' 1845, 44.

¹⁴ Stubenrauch, l. c.

¹⁵ 'Rhein. Sanitätsber. für das Jahr 1845,' 36.

¹⁶ Santlus, 'Journ. für Kinderkrankh.,' 1854, Heft 7, 8.

¹⁷ Saucerotte, 'Gaz. méd. de Paris,' 1848, 306.

¹⁸ 'Sundhedskoll. Aarsberetning' for 1853, 23.

¹⁹ Pfeilsticker, 'Württemb. med. Correspondenzbl.,' 1853, 169; Köstlin, ib., 1854, 166.

²⁰ Account in 'Bayer. ärztl. Intelligenzbl.,' 1854, 425.

²¹ Klein, 'Mittheil. des badischen ärztl. Vereins,' 1859, 129.

²² Ullmann, 'Ungar. Zeitschr. für Natur- und Heilkde.,' 1856, 201.

²³ 'Sverges Sundhedskoll. Berättelse,' 1857, 35, 1858, 33; 1860, 37.

²⁴ 'Sundhedskoll. Aarsberetning' for 1858.

²⁵ 'Horn's Archiv für med. Erfahr.,' 1812, Nov.—Dec., p. 507.

same effect ; and it was in that sense that Elliotson¹ wrote : "Croup is sometimes epidemic, that is to say, a great number of children in particular seasons are affected with it." All the observations adduced to prove the occurrence of croup in epidemics do not concern true croup, but those severe affections of the laryngeal mucous membrane which occur so often in the course of angina maligna (diphtheritis of the throat).

§ 26. OCCURS MOST IN EXPOSED LOCALITIES.

We may see by a glance at the foregoing sketch of the distribution-area of croup that it is a malady indigenous mostly to higher latitudes ; and in fact the influence of geographical position, which can be in its turn analysed into conditions of climate, is even more pronounced in it than in the case of bronchial catarrh. It had been pointed out by Home (l. c., p. 7), on the ground of his Scottish experiences, that croup is prevalent mostly in localities on the coast, with a damp climate ; and if later observations have modified that dictum even to a material extent, there is a general agreement that the disease is met with mostly in localities with a cold and wet climate, subject to great ranges of the temperature and with a wet soil, or in narrow valleys swept by raw winds, or on wide and sparsely-wooded plains or uplands with little protection from cold winds (in our part of the world, northerly or easterly), or under the like circumstances of place ; and that whenever croup occurs in lower latitudes—and that is very seldom—it is mostly in districts wherein the climate has those same characteristics as a result of some peculiarity in the position or exposure.

Thus, Authenrieth observes that croup in Würtemberg is commonest in the districts at the foot of the Swabian Alp, swept by strong winds and subject to drenching rains precipitated from the clouds breaking on the mountain. Jurine has shown that the prevalence of croup at several places in Switzerland depends upon the like climatic conditions. In the same connexion Fontell calls attention to the prevalence of the disease on the damp coast of Finland. We read in

¹ 'Med. Gaz.,' 1833, April, p. 66.

Huss's account of the small endemic centre of croup in Sweden, that it is comprised within two square miles (Swedish), and that it is a flat, low, and almost treeless tract exposed to the high winds from north and east; whereas the neighbouring country, which is exempt from the malady, is hilly and densely wooded, although the characters of the soil are otherwise the same as in the former. Archer¹ states that in Maryland croup is commonest on the wet levels lying between Chesapeake Bay and Bush River, and less common in the wooded and hilly parts of the State. Van Leent informs us that in the East Indies cases of croup are oftenest met with where the climate is damp and liable to great fluctuations of temperature.

§ 27. INFLUENCE OF DAMP SOIL.

From these and many more facts of a like kind, we may learn at the same time how far *conditions of soil*, as influencing the climate of a locality, are a determining factor for the occurrence of croup. It is obvious from the distribution area of the malady that it is found on every geological formation, at all elevations, and with the most various configurations of the surface; but there is no doubt that the frequency of the disease is helped by those factors of locality which impress on the climate the character above sketched. Among such factors, special importance has been laid on *damp soil*; and in this connexion, Crawford states that in the eastern division of Perthshire, particularly in the broad strath known as the Carse of Gowrie, the cases of croup which used to be very common there have become a good deal less frequent since the ground has been drained.

§ 28. MOSTLY A MALADY OF THE COLD SEASON.

If we now proceed to consider how far the prevalence of croup depends upon the *season* and the *weather*, we shall be in a position to answer the question as to the influence of the above-mentioned climatic conditions on the development

¹ *Essay on Diseases of Children*, Edin., 1801, p. 31.

of the malady. In all parts of the world, from which there are any accounts of croup, the maximum of the disease falls, according to unanimous testimony, within the period from the end of autumn to the beginning of spring (October to March); or, in equatorial and subtropical regions, within the transition-period corresponding to those seasons, as, for example, during the rains on the southern littoral of Australia (Richardson, Bourse). In like manner all the so-called "epidemics" of croup (*i. e.* agglomerations of cases) touch their highest point without exception in the season from October to March.

The figures of croup-mortality in recent years are in great part vitiated by the fact that croup and angina maligna (diphtheritis of the throat) have been mixed up either of purpose or inadvertently. I have been able, accordingly, to use only a small number of statistical returns so as to illustrate the propositions above indicated, as there are only a few which are in a measure based on trustworthy observations.

In Sweden, during a period of fifteen years (1862—1876), there were 3462 deaths from croup officially notified; and these were distributed as follows: January to March 1087, April to June 748, July to September 543, October to December 1084; or, 2171 cases in the half-year from October to March, and 1291 cases in the summer half from April to September.

Monthly Deaths from Croup in Localities with nearly the same Climate.

	Period.	Months, January being I.											
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Berlin ¹	1876-1883	291	293	189	201	173	161	122	85	122	185	205	207
Middle Franconia ²	1868-1869	165	119	122	59	41	56	29	31	42	81	79	94
Frankfort-o.-M. ³	1863-1881	21	21	24	18	29	9	11	8	8	18	13	24
Baden ⁴	1852	51	52	55	47	36	25	12	13	21	31	45	64

¹ The figures are taken from the 'Annual Statistical Report of the City of Berlin.'

² According to information by Mair in 'Bayer. ärztl. Intelligenzbl.,' 1869, p. 293, 1870, p. 426.

³ From the statistical returns of the civil population in Frankfort.

⁴ From the 'Mittheil. des badischen ärztl. Vereins,' 1854, No. 6, p. 48.

According to this table 2384 deaths belong to the period from October to March, and 1359 to the months from April to September; the lowest quarter, with 504 cases, is that of July, August, and September, during which the deaths from croup do not touch the figure reached by January alone. The mortality statistics of New York and Philadelphia give the same result. In the former, according to Niles and Russ, there were in all 1249 deaths from croup from 1816 to 1826; and of these only 202 belonged to June, July, and August, while 401 occurred from October to December. At Philadelphia, in 1858, there were 292 deaths from croup, of which 202 were in the months January—March and October—December, and 90 in the other six months (April—September).

It is very obvious that this law of distribution of the disease in the several months or seasons has some causal connexion with the meteorological states proper to them, and that a somewhat low temperature and a high degree of saturation of the air, in other words, cold and wet weather, come mostly into the account; so much so, that when Elliotson says, "the cause [of croup] is undoubtedly in almost every instance cold and wet," he expresses the conviction which has been forced upon almost every observer. That opinion is by no means weakened by the fact that outbreaks of croup occur sometimes in the warmer months, inasmuch as during the summer season also a sudden fall of temperature, or extreme differences between the day and night temperature, or the sudden setting in of cold winds (in our part of the world and over much of North America, from the east and north) along with a high dew point, induce the same kind of weather, that is to say, cold and damp; a state of atmosphere that would make itself felt all the more owing to the high temperature immediately preceding. Drake's remarks on the occurrence of croup in the interior valley of North America (Mississippi) during the early summer are especially noteworthy:

"There is another period, in which it [croup] frequently occurs. This is the month of June, when in the middle latitudes of the Valley the early portion of the night has become so hot that the windows of sleeping rooms are thrown open, while the surface of the earth is not yet heated to any great depth, and the radiation of caloric renders the

latter part cool and damp. Such an atmosphere, acting, as it is too often permitted to do, on the naked skin of the sleeping child, awakens this disease."

We have corresponding accounts from other parts of the world; as, for instance, the subtropical region of Egypt, where croup, as Pruner tells us, sometimes occurs in summer when hot and cold days come in alternation. Many of the observers¹ having been constrained to lay special stress on the influence of raw winds in the production of croup, we can hardly dismiss the idea that they may contribute to bring about the malady as well by their direct action on the laryngeal mucous membrane as by the vicissitudes of temperature which they occasion.

§ 29. SOME CHILDREN MORE DISPOSED TO IT THAN OTHERS,
ACCORDING TO THEIR UPBRINGING.

A very important condition for the production of the disease, and one that is pointed to by the fact that croup is almost confined to the age of childhood, is *predisposition* of the individual to take it, whether that be looked for in certain anatomical circumstances, or in a particularly keen susceptibility to the exciting causes; or, in other words, whether it be congenital or acquired. The occurrence of cases of croup, at somewhat long intervals, among the children of the same family has seemed to some to warrant the conclusion that we have here to do with an inherited disposition of that kind; but it is a much more likely supposition that something wrong in the upbringing of the children, particularly in the way of too much tenderness and coddling, has been the real cause of the family liability.

In favour of that view we have the noteworthy circumstance that croup, according to the experience of many

¹ Huss for Sweden; Otto for Copenhagen; Sachse for Mecklenburg; Zimmermann for Hamburg; Gutfeld for Altona; Albert and Heinecken for Bremen; Küttner ('Journ. für Kinderkrankh.,' 1855, xxv, 19) for Dresden; Ebel for the Odenwald; various authorities for Zürich; Simonin for Nancy; Jankovich ('Pesth und Ofen mit ihren Bewohnern, &c.,' Ofen, 1838, 201) for Pesth; Hosack ('Essays on Various Subjects of Med. Sc.,' New York, 1824, ii, 139) for New York.

practitioners,¹ is much commoner among the children of the well-to-do classes of the people than among those who are less well off, the proletariat in particular; and accordingly that the susceptibility which predisposes to the disease would seem to be bred in those children who are kept most from the effects of the weather, sheltered from every wind, and during the cold season anxiously detained whole days and even weeks indoors, and that too, in heated and not always well-ventilated nurseries.²

I must not go beyond these suggestions touching a question that lies remote from my task. I shall only say further that communicability or *contagiousness* must be decidedly negatived for genuine croup, the observations adduced by several authorities in favour of that doctrine having reference, not to that disease, but to cases of *angina maligna* (diphtheria) secondarily complicated with croup.

¹ During a three years' practice among the poor in Danzig, extending over one third of the whole town, I had very few opportunities of seeing cases of croup, although the disease is common in Danzig; my cases during that period were relatively much fewer than they were subsequently for a similar period of somewhat extensive private practice.

² Compare the inquiries of Krieger ('*Aetiologische Studien*,' Strassb., 1877, p. 56), as to the influence of an artificial atmosphere, particularly that of an apartment, in creating a predisposition to respiratory affections.

CHAPTER V.

DIPHTHERIA.

(ANGINA MALIGNA, BÖSARTIGE BRÄUNE,¹ GARROTILLO.)

§ 30. BRETONNEAU'S DOCTRINE OF DIPHTHERIA; SUBSEQUENT DEVELOPMENTS OF THE SAME; THE DEFINITION HERE ADOPTED.

A new epoch, as we have seen (p. 49), in the doctrine of acute inflammatory disease of the mucous membrane of the throat and larynx, was made by Bretonneau's work, '*Des inflammations spéciales du tissu muqueux.*' Following up the earlier inquiries into the anatomical characters of fibrinous croup, Bretonneau declared, and at the same time upheld his opinion by giving many observations relating to the matter in hand, that this peculiar form of degenerative disease of the mucous membrane was by no means peculiar to the laryngeal, tracheal, and bronchial mucous surfaces, but that the mucous membrane of the mouth and throat was subject to it in like manner; that the forms of disease which had been hitherto described under the names of "stomacace" (the "fegar" of the Spaniards), and of "angina maligna" (the "garrotillo" of the Spaniards), were merely affections of the mucosa of the mouth and throat identical with croup; that "angina maligna" had no gangrenous process underlying it, as had been hitherto assumed; that the term "angina gangrænosa" should accordingly be given up; that the characteristic thing in this form of inflammation, as in croup and stomacace, was rather the production of a firm exudation on the mucous

¹ The word "Bräune," which used to be written also "Präune," is not in any way derived from "braun" (brown), but from "pruna," i. e. "glowing embers." "Pruna" occurs also in the sense of "anthrax" or the so-called "ignis persicus."

surface resembling a skin (*διφθέραι*) ; and that he had therefore chosen the term "diphtheritis" to designate that morbid process.

The central point of Bretonneau's position is shown by the following quotations from his book, a work which seems to me to be more often mentioned than read: "La gangrène scorbutique des gencives, le croup et l'angine maligne, ne sont qu'une seule et même espèce de phlegmasie" (p. 10). With reference to the "gangrène scorbutique des gencives," he says (p. 125): "Le lecteur doit savoir que je n'entends parler ici que de la stomacace." As to the alleged gangrenous character of angina maligna, we read (p. 11): "L'angine maligne ou gangréneuse n'est pas gangréneuse;" and again (p. 48): "La fétidité de l'haleine dépend de la putréfaction de cette même production albumineuse, qui simule des escarres sur toutes les surfaces affectées d'inflammation pelliculaire." He admits, however, the possibility of the occurrence of necrosis of the mucosa in angina maligna (p. 52): "La gangrène doit être fort rare, puisqu'il ne s'est présenté une seule fois dans plus de cinquante ouvertures de cadavres."

While Bretonneau would thus take the three forms of disease above mentioned to be quite the same, from the morbid-anatomy point of view, and as differing only in the seat of the affection, he explains that the lesion of the throat in scarlet fever (the so-called scarlatinal diphtheria), and the "simple" membranous inflammation of the pharyngeal mucous membrane ("l'angine couenneuse commune"), are very like angina maligna, and therefore very often confused with the latter, although entirely distinct from it in the type of the process.

Altogether different from diphtheritis, he says (p. 48) is "l'angine scarlatineuse, inflammation couenneuse accompagnée d'exanthème cutané, et qui a souvent été confondue avec phlegmasie diphthéritique, quoiqu'elle en diffère essentiellement par son mode d'invasion, sa durée et ses diverses terminaisons;" a view which he develops later on (p. 250) in speaking of what he considers to be the diagnostic error of Fothergill and others in their writings upon angina maligna and scarlatinal sorethroat. At p. 260 he says, "L'angine couenneuse commune est de toutes les affections, qui se rencontrent fréquemment dans la pratique, celle qui est le plus difficile à distinguer, dans son principe, de l'angine diphthéritique."

Finally, he states that an affection of the mucous membrane of the throat, perfectly the same as angina maligna, can be set up artificially by the application of irritants:

"Parmi les substances les plus irritant," he says (p. 355), "le principe vésicant des cantharides, extrait au moyen de l'éther et dissous ensuite dans l'huile d'olive, a donné naissance à un ensemble de phénomènes morbides qui offre une complète analogie avec l'inflammation diphthérique;" and again (p. 367): "Quelle que soit la ressemblance de ces deux modes inflammatoires, des caractères tranchés les distinguent. L'inflammation cantharidique bornée aux surfaces qui ont éprouvé l'action phlogistiquante du principe vésicant, ne tarde pas à se circonscire et à s'éteindre, tandis qu'il est dans la nature de l'inflammation diphthérique de prendre de l'extension et de persévérer."

In developing his doctrine of diphtheria and in establishing a peculiar character ("spécialité") for the inflammatory affection of the mucous membranes which he denoted by that term, Bretonneau introduced a new and important element into the teaching concerning the general processes of disease. But the credit that he thereby won was materially lessened by his one-sided conception of the facts, by mistaken judgments upon them, and most of all by the circumstance that he left entirely out of consideration the question of the cause of the affections included by him under that notion, both as regarded the whole group and as regarded the several members of it. In his treatise there is not a single word relevant to causation; even in the passage where he speaks (pp. 365—379) of a "spécificité de l'inflammation diphthérique," the "spécificité," as will be seen from the foregoing extracts, is associated with a cause merely by way of suggestion. Bretonneau's standpoint, both in carrying out his inquiry and in recounting it, is essentially that of morbid anatomy; from that point of view the identity or dissimilarity of the nosological forms was decided upon; and very few of his contemporaries or immediate successors went beyond it. In France the notion of "angina maligna" was maintained for a time, in contradistinction to Home's and Guersant's idea of croup; but by degrees the term "diphtheria," in Bretonneau's meaning of it, got a footing, "croup" being kept as a technical term along with the former, while angina maligna was included under croup by identifying the two diseases according to Bretonneau's precedent; and in that sense the term "croup" came to be used afterwards in Germany, England, and other countries, in which the term "diphtheria" did

not become current until serious doubts as to the identity of the two diseases in question began to be entertained.

Although Bretonneau had uttered a warning against confusing diphtheria with other diseases of the throat like it, and had thereby directed attention, if only by the way, to the specific character of the former malady, those who came after him did not hesitate to describe everything as diphtheria (in Bretonneau's sense) which looked like diphtheria; indeed the confusion of ideas went so far as to raise the question, in regard to the so-called scarlatinal diphtheria, whether scarlet fever and diphtheria were not on the whole identical; and finally the notions of croup and diphtheria were still more generalised by distinguishing a "croupous process" and a "diphtheritic process" from the clinical side as well. There is no better sign of the confusion that had gradually found its way into the thoughts and speech of the medical world than the declaration¹ which Bretonneau found himself constrained to make twenty years after the publication of his admirable work:

"J'ai cédé au désir d'obtenir d'un nom spécifique la distinction d'une phlegmasie spécifique et qu'il importait de ne pas confondre avec d'autres affections qui n'avaient avec celle-là que des traits de ressemblance. L'application de cette dénomination faite chaque jour à contre-sens me prouve du reste que j'ai eu tort."

Into this chaos no light could come until medical science had advanced so far as to recognise:—that *causes of various kinds might underlie one and the same anatomical morbid process*; and, conversely, that *one and the same morbid cause, operating on a given tissue, may be able to call forth, under varying circumstances, nosological forms of different sorts*;—that, in forming our judgment of the peculiarity of a disease, or of the identity or distinctness of two or more diseases in a group, we must place ourselves, not in the anatomical point of view alone, nor exclusively in the clinical point of view, but have regard also and most especially to the etiological aspect, while we keep in mind all three factors together. No one entered at so early a date or with so much vigour into this conception as Virchow, who has on every occasion contested the anatomical view of the matter as

¹ 'Arch. gén. de méd.,' 1855, Jan., p. 6.

one-sided, and has, in his practice of morbid-anatomy research itself, succeeded in throwing light upon the so-called diphtheritic morbid process. In a like sense Recklinghausen has lately spoken¹ in brief but convincing words concerning the "croupous-diphtheritic inflammation;" and it is on such views as those that I base the following outline sketch of the angina maligna of the older writers, now designated by the name of "diphtheria."

Inflammation of a mucous membrane takes the form either of a catarrhal, or of a phlegmonous, or of a fibrinous (false-membranous) morbid process. In the last of these, we distinguish, in ordinary usage of speech, a croupous from a diphtheritic inflammation, according as the coagulable exudation is thrown down on the mucous membrane, that is to say, as it has involved the epithelial layer only, or has been deposited in the tissues of the mucosa, while a necrosis of the mucous membrane corresponding in breadth and depth to the extent of the deposit has set in. Differences in the ways of origin between these various forms of inflammation there are none: that is to say, one and the same cause of illness, according to the intensity with which it acts upon the mucous membrane, may call forth each of these morbid processes; although in that determination the kind of epithelium (whether flat or cylindrical), as well as the thickness of the tissue of the mucosa and of the sub-mucous layer, perhaps even the coarser or finer character of the tissue serving as the foundation of the mucosa and the more or less firm adhesion of the latter to it, may have an influence in deciding the type of the process—whether it is to be the croupous or the diphtheritic form. A clear proof that it is not so much the quality, but rather the degree of the inflammatory excitation which determines the kind of inflammation-process, is afforded by the fact that one and the same excitation operating on the mucous membrane of an organ may not unfrequently cause the various forms—the catarrhal, the phlegmonous, and the fibrinous—to show themselves side by side.

Causes of inflammation are either of a chemical nature, or thermic, or meteorological, or they are infective. So

¹ 'Handbuch der allgem. Pathologie,' Stuttg., 1883, p. 243.

far as relates to inflammation of the mucous membrane of the throat and larynx, chemical and thermic irritants come into consideration extremely seldom as etiological factors; excitants of that sort have been resorted to more often in experiment, in order to prove that the inflammatory process which develops out of their operation, will take at one time the catarrhal type, at another time the phlegmonous, at another time the fibrinous (croupous or diphtheritic), according to the intensity of the action. Meteorological influences, or, in other words, chills, are very often the occasion of inflammation of the laryngeal and pharyngeal mucous membrane; and under these circumstances the inflammation is mostly in the form of catarrh. It is only in the age of childhood that fibrinous inflammation of the laryngeal mucosa (so-called "true croup"), as we have seen in the preceding chapter, occurs at all frequently in addition to catarrhal inflammation (the "pseudo-croup" of Guersant); and it is then an effect of unfavorable weather-influences.

The processes, too, of infective disease, very often lead to the appearance of inflammatory affection of the mucous membrane of the throat and larynx, whether it be in the catarrhal, or the phlegmonous, or the fibrinous form. In these local affections incidental to various infective processes, there are no anatomical distinctions to be made out for them respectively; it is the morbid cause alone that makes the discriminating factor. And just as we distinguish clinically between a catarrh of the pharynx or larynx from chill and a catarrh incidental to measles, or again between the diphtheritic and necrotic inflammation of the throat produced by escharotic action of acids, alkalies, and the like, and the diphtheritic affection of the same tissue in scarlet fever; so ought we from the clinical point of view to regard as specifically different objects the catarrhal and fibrinous affections of the mucous membrane which arise out of the various infective processes. In several of the infective diseases the inflammation of the throat or laryngeal mucous membrane, in one form or another, is merely a secondary symptom, occurring with more or less frequency: as in measles, scarlatina, smallpox, typhoid, and typhus. But besides these instances of its occurrence, the same local

affection presents itself as the outcome of a special infection, implicating primarily and immediately the pharyngeal and laryngeal mucosa (whether directly or through the blood may be left out of account); and it is this peculiar and specific morbid process that used to be denoted by the name of "angina maligna," and has recently been known by Bretonneau's name of "diphtheritis," or, preferably, "diphtheria."

Regarding diphtheria from the point of view of morbid anatomy and clinical history combined, it presents itself in one or other of three forms:

1. As *catarrhal inflammation of the pharyngeal mucous membrane*, rarely of the laryngeal. In order to characterise it, and to distinguish it from the simple and non-specific angina catarrhalis pharyngea (quinsy), it is of use to note that it occurs, and sometimes prevails extensively, at times when the severer forms of diphtheria are epidemic, particularly in immediate proximity to those who are affected with the latter; but a more prominent diagnostic mark is the fact that the paralysis often observed after an attack of the severe form of angina maligna, is not unfrequently the sequel also of catarrhal angina maligna.¹

2. As *fibrinous (croupous-diphtheritic) inflammation of the pharyngeal and laryngeal mucous membrane*. Whether a croupous affection (in the sense before defined) ever occurs on the mucous membrane of the throat is doubtful. At all events it is in the diphtheritic form that the fibrinous inflammatory process occurs there most frequently; it is when it extends downwards to the mucous membrane of the larynx that it assumes the croupous character, although there also diphtheritic spots are met with as well. This form, which corresponds to the Spanish "garrotillo," seldom leads to death with phenomena of general secondary infection; it is fatal for the most part with the symptoms of true croup.

3. As *diphtheritic and necrotic inflammation of the mucous membrane of the throat*, with extension of the process not rarely to the nose or larynx and considerable destruction of the faucial structures, frequently running a fatal course

¹ Compare the interesting facts given by Boissarie in the 'Gaz. hebdom. de méd.,' 1881, pp. 310, 327.

under the symptoms of general infection, or causing death in a paroxysm of suffocation.

Such is the true and specific "angina maligna" or "diphtheria," sometimes catarrhal in type and sometimes fibrinous, which forms the subject of the following sections.

§ 31. OUTBREAKS IN ANTIQUITY AND THE MIDDLE AGES IDENTIFIED AS DIPHTHERIA.

The *history of malignant sore-throat* (diphtheria) may be followed up into antiquity with a high degree of certainty. Even if it should appear more than doubtful whether certain passages quoted by Israel¹ from the Talmud,² as well as certain passages in the Hippocratic collection,³ do indeed refer to that disease; still, in the writings of some of the later Greek physicians, particularly Aretæus⁴ and Aetius,⁵ we meet with descriptions of an affection of the throat, as to the identity of which with angina maligna there can be hardly any doubt. Aretæus, who, like Aetius, indicates the malady as one that occurs mostly in the age of childhood, says that it is met with oftenest in Egypt and Syria, particularly in Coele-Syria, and is therefore known by the name of ἄλκη Διγύπτια καὶ Συριακή.

The best description of the disease is given by Aetius, who makes mention also of the paralysis of deglutition remaining over from the attack: "Crustosa et pestilentia tonsillarum ulcera, ut plurimum nullo præcedente tonsillarum fluxu incipiunt, aliquando autem a consuetis fieri inflammationibus, maxime efferatis, perficiuntur. Fiunt autem frequentissime pueris atque etiam ætate jam perfectis, maxime iis qui

¹ 'Nederl. Tijdschr. voor Geneesk.,' 1861.

² 'Talmud Babylonicum,' Tract. Berachoth 8 a, Sabbath 33 b, Taanis 31 b.

³ Particularly in 'Lib. de dentitione,' § 20, seq. ed., Littré viii, 546-48; and in

⁴ 'Lib. epidemior.,' vi, sect. vii, § 1, ed. cit., v, 330, where the reference is to an epidemic of cough in Perinthos (specially commented on by Littré, 'Oeuvres compl. de Hippocrate,' x, 1, and 'Gaz. méd. de Paris,' 1861, p. 353).

⁵ 'De causis et signis acut. morb.,' lib. i, cap. ix, ed. Kühn, p. 17.

⁶ 'Tetrabiblion' ii, sermo iv, cap. xlvi, ed. Stephanus, p. 397. A passage by Archigenes relating to the same disease gives a merely superficial account of it; the passage is quoted by Häser, 'Histor-pathol. Untersuch.,' i, 274, from the 4th book of Oribasius, discovered by Mai, 'Collect. auct. classic. e. Vatic. cod. edita,' iv, 197.

vitiosis humoribus abundant, in iis quae vere contingere solent pestilentibus constitutionibus. In pueris vero oris, ulcere quod aphtham vocant, praecedente omnino perficiuntur. Sunt autem partim alba, maculis similia, partim cinereo colore, aut similia crustis, quae ferro inuruntur. Accidit autem aegris siccitas in transglutiendo, et suffocatio coacervatim incidit. . . . Et febrium quoque curam habere convenit (vehementes enim incidere solent) atque in repurgandis explanandisque ulceribus maxime sollicitum esse; convulsionem enim infantes plurimi passi sunt in ulcerum repurgatione; aliqui vero via transglutiendi exsiccata, sunt strangulati. Sunt etiam quibus corroduntur gurguliones, atque ubi diutius perstiterint ulcerationes et in profundum proserpserint, cicatrici jam inducta, adstrictiorem vocem edunt, reflectiturque ipsis potus in ipsas nares; nam et ego puellam novi quae post quadragesimum tandem diem consumpta est, quum se jam a morbo recolligeret. Verum ad septimum usque diem plurimi periclinantur."

In the writings of the Arabians and the mediæval physicians of the West there are frequent references to malignant cases of "angina," which were not seldom fatal; but these statements relate in part to secondary throat affections in plague, typhus fevers, smallpox and the like, while in part they are too indefinite to warrant a conclusion as to the nature of the disease. On the other hand, there are accounts of epidemic forms of sickness in those ages given by some of the chroniclers, which may perhaps be taken as relating to malignant sore-throat.

Thus, in the chronicle of St. Denis for the year 580 mention is made of a "pest" which went by the name of "esquinancie," corresponding to "squinantia," a name subsequently applied to angina maligna. Under date 856, Baronius writes ('Annal. ecclesiast.') of a "pestilentia faucium, qua fluxione guttur obstructum citam mortem inferret," as having occurred at Rome; and of a similar epidemic in 1004,—"catarrhus descendens in fauces, meatus obstruens, suffocatos miseros homines confestim mori coge-bat." Cedrenus¹ records, under the date of 1039, an epidemic sickness known as *κυνάγχη*, which was prevalent in some provinces of the Byzantine Empire and caused a great mortality. In none of these accounts is it said that the age of childhood suffered particularly. On the other hand, Short²

¹ 'Compend. historiar.,' Paris, 1647, ii, 742.

² Quoted by Webster, 'History of Epidemic and Pestilential Diseases,' Hartford, 1799, i, 143.

refers to a kind of angina which was prevalent in England in 1389, and carried off a large number of children.

In the epidemiography of the sixteenth century, also, there are not a few accounts which may be taken with more or less certainty as applying to angina maligna. Entries in the chronicles¹ for the year 1517 mention an "unknown" sickness which spread over the Rhine districts, "so that men's tongues and throats were covered as if with a fungus, and turned white, and they were neither able nor inclined to eat or drink from pains in the head not unattended with pestilential fever." Connected with that epidemic, perhaps, was the outbreak observed at Amsterdam the same year, of "angina maligna contagiosa," of which Foreest² gives an account from the manuscript notes of Tyengius, a physician practising there at the time: "Ut quibus," we read, "intra sex aut octo horas apta remedia non adhihebantur, ante sedecim aut viginti horas subito moriebantur. Erat autem materia in illo morbo populari ita furiosa, ut uno momento tantam anhelitus difficultatem, cordis que angustiam et dolorem in collo pareret, ut aegrotus strangulari mox videretur."

A similar disease would appear from Sennert³ (who goes into no details) to have been again epidemic in 1544 and 1545 throughout several of the Low German and Rhenish provinces. From the same localities we have accounts⁴ for the years 1564 and 1576⁵ of "malignant angina," which, as Wier says, was particularly common among children and very destructive: "ob hanc causam quod eidem affecti primo die, nonnulli tertio aut quarto moriebantur, paucique ad septimum usque pertingebant."

¹ Frank von Wörd, 'Chronik fortges. von Calen. Ghönnner,' s. l., 1585, ii, 640; similar accounts in the Basel chronicle of Wurstissen, 1580, p. 707, and in the 'Schwytzer Chronik' of Stumpf, 1606, p. 114 a.

² 'Observat. et curat. medicina,' vi, lib. observ. ii, schol., Lugd. Bat., 1591, p. 10.

³ 'Pract. medicinae,' lib. ii, pars i, cap. 24, Wittenberg, 1654, p. 94.

⁴ Van Wier, 'Observat.,' lib. i, § 3, Op. Amstelod., 1660, p. 910; and Gemma, 'De naturae divinis characteribus,' &c., Antwerp, 1575, ii, 44. Perhaps we should take as relating to the same epidemic the statement by Pascal as to the prevalence of a malignant sore-throat in Alsace ('Mém. de méd. milit.,' 1841, li, 5).

⁵ Wier, l. c.

§ 32. THE GREAT EPIDEMICS IN SPAIN AND OTHER COUNTRIES
IN THE SIXTEENTH TO EIGHTEENTH CENTURIES.

The first absolutely trustworthy epidemiological information about angina maligna dates from the end of the sixteenth and beginning of the seventeenth century. It comes from *Spain*, where the disease, known under the popular name of "garrotillo,"¹ was epidemic year after year for full thirty years (1583-1618), and reappeared from time to time at various parts of the country throughout the seventeenth century.² Besides Spain, it visited *Portugal*, *Southern Italy*, *Central Italy* and the adjacent islands, making its first epidemic appearance in that group of countries in 1618.

In *Spain*,³ the disease showed itself first at Seville in

¹ Garrotillo is originally the name of the small truncheon which was used in Spain by the executioner to strangle criminals condemned to death.

² That the disease had occurred in Spain before this, and was well known under the same name, may be inferred from the treatise of the Spanish physician Gutierrez de Angulo, 'Tratado del enfermedad del garrotillo;' the writer was born in 1444 at Anteguera, in the province of Malaga, and died there in 1522. I am not acquainted with the contents of his treatise, having merely found the title of it quoted by Morejon in his 'Histor. bibliogr. de la medicina española,' Madrid, 1843, ii, 211.

³ I give here in chronological order the more important works relating to this epidemic; most of them are very rare; those that I have myself made use of are indicated by a star:—*De Villa Real, 'De signis, causis . . . et curatione morbi suffocantis,' libri iii, Compluti 1611. Gonzalez de Sepulveda, 'Tratado sobre el garrotillo en el ano de 1606,' s. l. e. n. *de Fontecha, 'Disputationes med. . . de anginarum naturis . . . et circa affectionem hisce temporibus vocatam Garrotillo,' Compluti 1611. *Cascales, 'Liber de affectionibus puerorum . . . de morbo illo, qui vulgariter garrotillo appellatur,' Madr., 1611. *Perez de Herrera, 'Tract. de essentia, causis, notis . . . et precautione faucium et gutturis anginosorum morbi suffocantis garrotillo hispan. appellati,' Madr., 1615. *Nunnez de Lerena, 'De gutturis et faucium ulceribus anginosis, vulgo garrotillo,' Sevilla, 1615. de San Millan, 'Parecer en que se trata . . . de la enfermedad que vulgarmente blaman garrotejo,' Zaragoza, 1616. de Soto, 'Libro del conocimiento . . . de la enfermedad del garrotillo,' &c., Granada, 1616. *Mercado, 'Consult. med. lib. cons. xiv,' in Opp., Frankf., 1620, 134. 'Charta imperialis de morbo suffocativo,' Madr., 1620. Tamaño, 'Tratado breve de algebra y garrotillo,' Madr., 1621. de la Perra, 'Polyanthea medicis speciosa,' &c., Madr., 1625. Sola, 'Del garrotillo sive de morbo suffocante,' Sevilla, 1630. *de Heredia, 'De morbis acutis,' lib. ii, sect. iii, cap. 5, Lyon, 1685 in Opp. Antwerp, 1690, iii, 100. See also Villalba, 'Epidemiologia española,' &c., Madr., 1802, 201, ff. Ant. Mar. Barbosa, 'Estudios sobre o garrotillo ou croup,' Lisboa, 1861, and Iglesias, 'Siglo medico,' 1862, No. 434, ff.

1583, and spread over the whole of Andalusia in the course of the next eight years (down to 1591). In 1596 it was in Granada, in 1600 in Estremadura, 1603 in New Castile; but it was not until 1610-18, that it reached its widest diffusion over a great part of the country, one of the worst years being 1613, which has borne the name of "anno de los garrotillos" in memory of the frightful mortality caused by the pestilence. In 1630 it raged anew in Saragossa and other parts of Arragon,¹ and at the same time in Antequera (Granada);² in 1645 and 1646, in Alaejos;³ and lastly in 1666, when it once more attained a considerable diffusion over the country.⁴ Portugal was first visited by angina maligna in 1626; but it would appear to have suffered on the whole very little.⁵

In Italy, malignant sore-throat had been epidemic, along with infectious pneumonia, in 1610, in Mantua and Lombardy, as well as in Guastalla (Reggio d'Emilia);⁶ but it was not until 1618-42, that it became generally diffused in that country. In 1618, the same year in which the sickness wrought frightful devastation in Spain, it began in the city of Naples, gradually overran the kingdom of the Two Sicilies and the States of the Church⁷ (the latter having a particularly severe visitation in 1633 and 1634),⁸ appeared in the

¹ Gil de Pina, 'Tratado de la curacion del garrotillo,' &c., Zaragoza, 1636; Zacutus Lusitanus, 'Prax. med.,' lib. i, obs. 99, Op. Lugd., Batav., 1667, iii, 23.

² Gutierrez de Antrade, 'Tratado del la enfermedad del garrotillo.'

³ De Villa Mediana, 'Consulta de los carbuncos que cormen la villa de Alaejos,' Valladolid, 1663.

⁴ Vasquez, 'Morbi essentia, qui non solum per hanc insignem urbem Toletanam, sed per totam Hispaniam sparsim grassatur,' &c., Toledo, 1669.

⁵ Barbosa (l. c.) quotes from two manuscript records of this epidemic relating to the town of Olivenza, which are preserved in the Archives of Lisbon. Printed accounts of the epidemic in Portugal would appear not to be available.

⁶ See Corradi, 'Annali delle epidemie occorse in Italia,' iii, 16. The authorities are Grassi, 'Consultatio med. morborum qui et Gustalæ et Mantuæ nunc vagantur,' Mantua, 1610; and Ravicio, 'Influsso maligno osservato nella terra di Guastalla l'anno 1610,' Venet., 1613.

⁷ Boncore, 'De popolari ac pestilenti gutturi, annexarumque partium affectione, nobilissimam urbem Neapolim ac totum fere Regnum vexante,' Neap., 1622. Carnevale, 'De epidemico strangulatorio affectu, &c.,' Neap., 1620. Foglia, 'De auginosa passione . . . per inclytam hanc Neapolis civitatem . . . vagante,' Neap., 1620. Nola, 'De epid. phlegmone anginoso grassante Neapoli,' Venet., 1620. Sgambati, 'De pestilenti faucium affectu Neapoli saeviente,' Neap., 1620. Corradi, l. c., p. 26, seq.

⁸ Baroni, 'De peripneumonia anni domini 1633 . . . Flaminiam infestante

island of *Sicily*¹ in 1623 (probably also in *Sardinia* and *Malta*), became very general in Sicily in 1632,² was seen in San Remo (Liguria) in 1639,³ and did not cease, as an epidemic, until 1642, in which year it was very malignant a second time in the city of Naples.⁴

Much more extensively than in the seventeenth century, although nowhere with such virulence as in the Spanish and Italian epidemics of that period, was angina maligna prevalent in the eighteenth, not only on European soil but also in some parts of the Western Hemisphere. On the very threshold of the century, in the year 1701, besides appearing in the *Ionian Islands* (particularly Milos),⁵ it broke out afresh in certain provinces of Spain;⁶ in 1715 it was prevalent in Aguilar de Campos (province of Palencia),⁷ 1749 at Lisbon, Leiria and other Portuguese towns (where it was known as "bolhos de Garganta")⁸; from 1750-62 in many parts of New Castile and Galicia,⁹ 1764-71 in Valencia,¹⁰ and again at Lisbon in 1786.¹¹ Connecting in order of time with this train of epidemics in the Iberian peninsula comes the outbreak of angina maligna in *France*. The first trustworthy accounts¹² of it from that country date from the years 1745-50, in which the malady was epidemic at Paris,¹³ Ver-

libri duo,' Foro Livii, 1636. Cletus, 'De morbo strangulatorio opus,' Romae, 1636; Corradi, pp. 142, 146

¹ Cortesi, 'Miscellan. med.,' Messanae, 1625, Dec. ix, 696, 705; Corradi, p. 44.

² Alaymo, 'Consultatio pro ulceris syriaci curatione,' Panormi, 1632; Corradi, p. 138.

³ Bacini, 'De angina ulcerosa tractatio,' Papiæ, 1619; Corradi, p. 151.

⁴ Severinus, 'De paedangone maligna, &c.,' s. l. 1652; also in his treatise, 'De recondita abscessuum natura,' Frankf., 1643, p. 428; Corradi, p. 154.

⁵ Tournefort, 'Relat. d'un voyage du Levant,' Paris, 1717, i, 65.

⁶ Morejon, l. c., vi, 349.

⁷ Fernandez, 'Tratado de las epidemias malignas, &c.,' Madrid, 1725.

⁸ Aloys. Barbosa, 'De angina ulcerosa ab anno 1786 ad annum 1787 apud Leiriam epid. grassante comment.,' Lisbon, 1789.

⁹ Thiéry, 'Observ. de phys. et de méd.,' ii, 160.

¹⁰ Pasqual, 'Tratado del garrotillo maligno, &c.,' Valencia, 1784.

¹¹ Barbosa.

¹² I have taken every pains to eliminate those epidemics which are not genuine angina maligna, but are cases of an affection of the throat and larynx occurring in the course of scarlet fever. They have been described under the name of "maux de gorge," and have been often confounded by historical writers with true malignant diphtheria.

¹³ Astruc in Chomel, 'Diss. sur le mal de gorge gangréneux, &c.,' Par., 1769.

sailles,¹ Orleans,² Lille,³ Rouen,⁴ Amiens,⁵ Chalons-sur-Marne,⁶ Montpellier⁷, Nerac⁸ and other places in Guyenne, and in Bearn.⁹ It was seen again at Paris¹⁰ in 1758, 1759 and 1762, at Forges, Lisieux and other Norman¹¹ towns in 1774, and at Poitiers¹² in 1787.

At the time of its general diffusion in France, there occurred its second outbreak in Italy, and its first appearance in some parts of Holland and England. In *Italy* a severe epidemic of malignant sore-throat was observed in and around Cremona¹³ in 1747; it was afterwards prevalent at Ponte Lungo¹⁴ in 1759 and in Istria¹⁵ in 1786. For *Holland* the first accounts of it date from 1745 and 1746 from Dalhem¹⁶ near Liège; and we have later accounts of epidemic outbreaks in that country from Utrecht¹⁷ in 1750 and 1769-70, and from Dordrecht and Rotterdam¹⁸ in 1754. Simultaneously with its appearance at Dalhem (1745), it showed itself in *England* (at Liskeard and other places in Cornwall) where it continued until 1748;¹⁹ in 1790 there were many

Malouin, 'Hist. de l'Acad. des sc.,' 1746, 151; 1747, 563; 1748, 561. Boulland, 'Quest. med.: An angin. gangraen. emeticum?' Par., 1750.

¹ Borden, 'Oeuvres complètes,' Par., 1818, ii, 776.

² Du Hamel, 'Hist. de l'Acad. des sc.,' 1747, 337.

³ Boncher, 'Journ. de méd.,' viii, 556.

⁴ Le Cat, 'Philos. Trans.,' xlix, part 1, 49.

⁵ Malouin, l. c., 1748.

⁶ Navier, 'Diss. sur plusieurs malad. populaires . . . à Chalons, &c.,' Par.

1753.

⁷ Borden, l. c., i, 80.

⁸ Raulin, 'Traité des malad. occasionnées par les promptes et fréquentes variations de l'air,' Par., 1752, 142 (an excellent work).

⁹ Borden, l. c., ii, 775.

¹⁰ Id.

¹¹ Lepecq de la Cloture, 'Topogr. der Normandie,' from the French, Stendal, 1794, 78, 266.

¹² Lamarque, 'Journ. de méd.,' lxxxiii, 169.

¹³ Ghisi, 'Istoria delle angine epid. degli anni 1747 e 1748,' in 'Lettere mediche,' Cremona, 1749.

¹⁴ Galletti, 'Febbr. epid. in Ponte Longo,' quoted by Corradi, l. c., iv, 182.

¹⁵ Panzoni, 'Beschreibung der Krankheiten, welche 1786 in Istrien geherrscht haben,' from the Italian, Lübben, 1801, 18, 102.

¹⁶ Zaff, 'Synopsis observ. medic., &c.,' Lugd., Batav., 1751, 208.

¹⁷ Keetel, 'De angina epid. annor. 1750 et 1756,' Utrecht, 1773.

¹⁸ Stoeke quoted by Israels, l. c., 9.

¹⁹ Starr, 'Philosoph. Transact.,' lxi, 175.

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cases in London¹ and in 1793 it was widely prevalent at Chesham (Bucks) and in the hilly district around.²

In Switzerland, Germany and Sweden angina maligna did not occur as an epidemic malady until the second half of the eighteenth century. In *Switzerland*, it was very virulent in 1752 in the Simmenthal.³ The same year it was found in *Germany*, in the Harz⁴ country, 1755 in the diocese of Rampitz⁵ near Frankfurt-on-the-Oder, and 1790 at Osnabrück.⁶ In *Sweden*, from 1755-62, the epidemic spread to many places,⁷ including Stockholm, Upsala, and Colmar.

It is for the same period that we have the first accounts of the epidemic prevalence of malignant sore-throat in the *New World*.⁸ In 1752, many cases were seen at New York,⁹ in 1771 and 1772 there were epidemics of it there,¹⁰ in 1775 it is said to have been general in the Northern States¹¹ (then the North American colonies), and its prevalence in 1799 in Virginia may be inferred from Caldwell's statement that Washington died of it in that year at his estate of Mount Vernon near Alexandria.¹² Lastly, we have to mention its epidemic prevalence in Jamaica, as vouched for by Moseley;¹³

¹ Denman in Simmons's 'Med. Facts and Observations,' Germ. ed. 1790, p. 302.

² Ramsay, 'Transact. of a Soc. for the Improv. of Med. and Surg. Knowledge,' ii, 25.

³ Langhans's 'Acta Helveticorum,' ii, 260; also in 'Beschreibung verschiedener Merkwürdigkeiten des Simmenthales,' Zürich, 1753.

⁴ Hertzog, 'Diss. de febre catarrh. maligna epid. angina gangraenosa stipata,' Hal., 1788.

⁵ v. Bergen, 'Nova acta acad. Leopold.,' 1757, Obs. 83, i, 336.

⁶ Stipp, 'Diss. de angina gangraenosa,' Erford., 1792.

⁷ Berg, 'Forsök till de i Sverige gängbare sjukdomar för året 1755,' p. 36; Wilcke, 'Diss. de angina infantum,' Upsala, 1764 (in Sandifort's 'Thesaurus dissertationum,' ii, 347); Rosen v. Rosenstein, 'Kenntniss und Kur der Kinderkrankheiten,' from the Swedish, Gött., 1781, p. 622; Wahlbom, 'Berättelse till Kongl. Colleg. med. för året 1762,' p. 181.

⁸ In this part of the world also, inextricable confusion has been brought into the history of diphtheria by confounding it with scarlet fever. I had called attention to that danger in the first edition of this book, but without effect as would seem.

⁹ Middleton, quoted by Bayley, 'Cases of Angina trachealis,' New York, 1781.

¹⁰ Bard, 'Trans. of the Amer. Philos. Soc.,' i, 396.

¹¹ According to Webster, l. c., i, 261 (possibly scarlet fever).

¹² In the American edition of Cullen's 'First Lines of the Practice of Physic,' Philad., i, 260.

¹³ 'Treatise on Tropical Diseases,' Lond., 1787 (Germ. ed. Nürnberg, 1790, p. 191).

it is probably the same that is referred to by Lemprière¹ (who was living there at the time), when he says that "ulcerated sore-throat" sometimes occurs as an epidemic.

§ 33. REMISSION (EXCEPT IN FRANCE) FROM END OF EIGHTEENTH CENTURY UNTIL ABOUT 1860.

As the eighteenth century drew to a close, angina maligna retired into the background among the epidemic diseases which then held the stage. As evidence of this we have not merely a comparatively small number of writings on the malady from the first thirty or forty years of the nineteenth century; but still more the fact expressly affirmed by many observers in all sorts of places, at the time when malignant sore-throat became widely spread in Europe and North America, that they had no knowledge of the disease when they first saw it. Down to about the year 1860 there was only one part of Europe where angina maligna prevailed widely, namely, France, which had been one of its principal seats in the previous century. It was not until that date that it assumed the character of a true pandemic, a character which it has maintained to the present day.

In the first part of this period, from 1800 to 1843, there were only occasional epidemics of angina maligna observed in Southern Europe, as at Padua² in 1805, in the island of Crete³ in 1816, and in 1835 at Lisbon, where the Duke of Leuchtenburg died of it. Besides these, the epidemics which developed within the same years on French soil were both numerous and extensive. The earliest account of them dates from 1810-11, in which years the disease was prevalent in Lyons⁴. Then comes the account which Bretonneau gave in his famous work, of the epidemic observed by himself at Tours in 1818-21, and at La Ferrière in 1824-25; following which are epidemics in Paris,⁵ in the Department of

¹ 'Pract. Observ. on Diseases of the Army in Jamaica, &c.,' Lond., 1799, i, 46.

² Penada, 'Observ. med.-meteorol. di Padova,' Quinq. iv, 286, 304.

³ Sieber, 'Reise nach der Insel Kreta im Jahre 1817,' Luz., 1823.

⁴ Martin in Ozanam, i, 241.

⁵ Ribes, 'Revue méd.' 1828, Oct., 43.

the Lot,¹ in Nantes,² in Arras,³ and several districts of the Department Eure-Loire.⁴ But it was in the years 1825-36 that the malady reached its widest prevalence in France; for those years there are many accounts of epidemics—in the Orléannais⁵ (particularly Department Loiret⁶), in Touraine⁷ (mostly Loire-Cher⁸ and Indre-Loire⁹), in Anjou (Maine-Loire,¹⁰ Sarthe,¹¹ and Mayenne¹²), in Brittany (Nantes¹³), in Normandy (Orne¹⁴), in Picardy¹⁵ (Seine-Marne¹⁶ and Seine¹⁷), and in Isle-de-France; from which enumeration it would appear that the disease had been confined mostly to the north-west. Outside that circle there was only one epidemic observed in those years, at Limousin¹⁸ in the Haute-Vienne. For the years immediately following there are accounts of angina maligna in the Vosges¹⁹ and at Paris²⁰ (1839), and in the Nivernais (Dept. Nièvre), Burgundy (Saône-Loire⁶) and the East of France (1841).

In these same years we meet with a somewhat considerable

¹ Desgenettes, 'Bull. de la faculté de méd. de Paris,' 1819, vi, 395.

² Priou, 'Journ. gén. de méd.,' xvi, 360.

³ Ref. in 'Arch. gén. de méd.,' vii, 463.

⁴ Girouard, 'Journ. gén. de méd.,' ciii, 312.

⁵ Bouillon-Lagrange, 'Gaz. hebd. de méd.,' 1859, Juin, 359.

⁶ Ref. in 'Revue méd.,' 1829, Oct., 137.

⁷ Menon, ib., Aug., 262; Bretonneau.

⁸ Gendron, 'Journ. gén. de méd.,' cix, 32; 'Arch. gén. de méd.,' 1883, Nov.; 'Journ. complém. du Dict. des sc. méd.,' xxiii, 346; 'Transact. méd.,' iii, 293. Ranque, 'Annal. de méd. physiol.,' 1828, Févr.

⁹ Guimier, 'Journ. gén. de méd.,' civ, 165. Ref. in 'Revue méd.,' 1829, l. c. Bridel, 'Journ. de méd. et de chirurg.,' 1835, Mars.

¹⁰ Ouvrard, 'Revue méd.,' 1826, Decbr., 512. Ridard, 'Gaz. méd. de Paris,' 1834, 273.

¹¹ Lespine, 'Arch. gén. de méd.,' 1830, Aug., 519.

¹² Lemercier, 'Bull. gén. de thérap.,' 1833, Nov.

¹³ Priou, l. c.

¹⁴ Bianquin et Martin, quoted by Emangard, 'Mém. sur l'angine épid.,' &c., Paris, 1829.

¹⁵ Bouillon-Lagrange, l. c.

¹⁶ Ferrand, 'Diss. sur l'angine membraneuse,' &c., Par., 1827.

¹⁷ Bourgeois, 'Revue méd.,' 1829, i, 159, 323; 'Journ. gén. de méd.,' cvi, 122, 436, cix, 137.

¹⁸ Mazard, 'Bullet. des sc. méd.,' ix, 138.

¹⁹ George, 'Mém. de l'Acad. de méd.,' ix, 31.

²⁰ Boudet, 'Arch. gén. de méd.,' 1842, Févr., Avril; Becque:el, 'Gaz. méd. de Paris,' 1843, Nr. 43 ff.

²¹ Daviot, ib., 1846, Nr. 9, 178.

focus of the disease in *Switzerland*, which in 1826 included Geneva and many places in the Canton Vaud.¹ In *Germany* there were epidemics in 1801 at Marienwerder² and several places in East Prussia;³ later accounts speak of isolated cases of angina maligna at Brotterode⁴ (Harz) in 1837 and at Lüneburg⁵ in 1841; respecting which latter Münchmeyer states that they were the first cases of the malady that had come to his notice during twenty-six years' practice.

From the *British Islands* also, we have information of the same kind as to the occurrence of occasional cases of angina maligna in the early years of the present century; as, for example, by Cheyne⁶ and Bewley⁷ for Dublin, by Perry⁸ for Glasgow, and by Abercrombie⁹ and Begbie¹⁰ for Edinburgh. But it was seen also in epidemic form at various parts of the country, as in Kent¹¹ (1817), at Glasgow¹² (1819 and 1825), and at Kelso¹³ (1825).

About the same time (1824) we find accounts of an epidemic of angina maligna at Skien in *Norway*; ¹⁴ and, lastly, there are epidemics of the disease reported from the *United States of America*—Philadelphia¹⁵ in 1809, New York,¹⁶ Salem,¹⁷ (New Jersey), and Danville,¹⁸ Ky., in 1826, Northumberland, Pa., in 1830, as well as from the Mexican town of Orizaba¹⁹ in 1836.

¹ Baud, 'Bibl. universelle,' 1829, xl, 233, 333.

² Maercker, in Hufeland's 'Journ. der pract. Heilkde.,' 1804, xix, Heft 3, 78.

³ Elsner, 'Bericht über den Gesundheitszustand Ostpreussens im Jahre 1801,' Königsb., 1802.

⁴ Fuchs, 'Kurhess. Zeitschr. für Heilkde.,' 1845, ii, Heft 1, 13.

⁵ 'Hannov. Annal. der Heilkde.,' 1842, N. F., ii, 410.

⁶ 'The Pathol. of the Membrane of the Larynx, &c.,' Edinb., 1809.

⁷ 'Dubl. Journ. of Med. Sc.,' 1836, Jan., 401.

⁸ Percy, according to Finlayson, 'Glasgow Med. Journ.,' 1881, July 2.

⁹ 'Diseases of the Stomach and Intestinal Canal,' Edinb., 1828.

¹⁰ 'Edinb. Med. Journ.,' 1862, May, 995.

¹¹ 'Second Rep. of the Med. Off. of the Privy Council, 1859,' Lond., 1860, 244.

¹² Brown, 'Glasgow Med. Journ.,' 1881, July 3; Mackenzie, 'Edinb. Med. Journ.,' 1825, April, 294; 'Med.-Chir. Review,' 1827, Jan., 290.

¹³ Robertson, 'Edinb. Med. and Surg. Journ.,' 1826, Apr., 279.

¹⁴ Munck, 'Eyr,' 1826, i, 222.

¹⁵ Caldwell, l. c.

¹⁶ Belden, 'Amer. Med. Record,' 1828, Jan., xiii, 123.

¹⁷ Beesley, 'North Amer. Med. and Surg. Journ.,' 1829, Jan., p. 66.

¹⁸ Smith, ib., 1829, Oct., p. 253.

¹⁹ Jackson, 'Med. Times and Gaz.,' 1859, April, p. 457.

²⁰ Poncet, 'Mem. de méd. milit.,' 1863, Févr., p. 90.

During the twenty years following the period of which we have been speaking, angina maligna presented itself in various parts of the world as before merely in sporadic cases, more or less numerous, or in small epidemics narrowly circumscribed both as regards duration and area. To that rule, however, *France* is again an exception; and along with it we have to include this time *Denmark* and *Norway*, where the malady had begun to be somewhat generally diffused since 1844. From *Italy* during the same years we have accounts of epidemics of malignant sore-throat, in 1844 and 1845 in Vasto,¹ Castelpetroso,² and other localities of the Abruzzi, Molise, and the kingdom of Naples,³ and in 1854 at Fonzaso in the province of Belluno.⁴ In *Germany*, from 1844 to 1853, cases were seen in larger or smaller numbers at various places in the Grand Duchy of Nassau;⁵ and there were true epidemics at Griefswald⁶ in 1844-45 and at Königsberg⁷ in 1850-51. From England, between 1845 and 1856, we have accounts of many scattered cases of angina maligna, the precursors of the severe epidemic which began to develop in 1857; these accounts come from London, Kent, Lincolnshire, Herefordshire, Staffordshire, Norfolk, Devon and Cornwall.⁸ During that period the disease was truly epidemic in two places only—Haverfordwest⁹ (Wales) in 1849 and Launceston¹⁰ in 1855. In like manner in Sweden, both north and south, there were many cases of angina maligna observed in 1852-55;¹¹ and there is information to the same effect from Amsterdam

¹ Barbarotta, 'Filiatre Sebezio,' 1846, Maggio.

² Ferrara, ib., 1845, Feb.

³ Guaita, 'Lo Sperimentale,' 1882, Maggio, p. 434.

⁴ Facen, 'Gaz. med. Lombard.,' 1866, Nr. 18.

⁵ Santlus, 'Journ. für Kinderkr.,' 1854, Heft. 7, 8; also 'Med. Jahrb. für das Herzogth. Nassau,' 1864, Heft 21, p. 146.

⁶ Stubenrauch, 'De angina membran. epid.,' Gryph., 1845.

⁷ Bohn, 'Königsb. med. Jahrb.,' 1858, i, 110.

⁸ Compare 'Second Report of the Med. Officer of Privy Council,' p. 174; 'Journal of Public Health,' 1855, Dec., p. 361; 1856, Oct., p. 302; 1857, April, p. 89; Radcliffe, 'Trans. Epidem. Soc.,' 1863, i, 328.

⁹ Brown, 'Med. Times and Gaz.,' xii, 670.

¹⁰ Thomson, 'Brit. Med. Journ.,' 1858, June, p. 440.

¹¹ 'Sundhedscollegii Berättelse,' 1852, p. 30; 1853, p. 68; 1855, p. 40; Wistrand, 'Ofversigt over Kgl. Vetensk. Akad. Förhandl.,' 1856, p. 265; 1857, p. 423.

and other places in *Holland*¹ for the years 1854-57, as well as from *Belgium* and from *Switzerland*, in which latter the disease was prevalent in 1854 at several localities of the Canton of Zürich.²

In *France* the general diffusion of the sickness appears to have been again mostly within the limits of the northern and eastern departments; at all events, nearly all the published accounts of angina maligna come from that region. Thus, we hear of it in Paris³ in 1846-48, at Laigle (Dep. Orne, Normandy⁴) in 1850, in the Arrondissements of Vitry-le-François, Epernay, &c. (Dep. Marne, Champagne⁵), at St. Pol (Dep. Pas-de-Calais⁶) in 1852, in the Arrondissement of Aisne (Dep. Aisne⁷) and in Valenciennes (Dep. Nord⁸) in 1853, and in Paris, Boulogne, and other places in 1855.⁹ On the other hand, from the South of France we hear only of an epidemic in 1852 in the Arrondissement of Marmande (Dep. Lot-Garonne), and of another in 1853 at Avignon.¹⁰ Connected probably with the prevalence of the disease during that period in France is the outbreak of angina maligna among the French troops in 1854 and 1855 during the war in the *Crimea* and in *Turkey*.¹¹ In *Denmark*, where also the malady became somewhat general in those years, groups of cases began to show themselves in increasing numbers in 1844-46 on the island of Fühnen and in Amt Viborg (Jutland); in the winter of 1847-48 an epidemic of angina sprang up at Lögstor (Amt Aalborg, Jutland); in 1847 the malady was epidemic also in Odensee and Vissenbjerg (Fühnen), and at several places in Jutland; and in the following years at many parts of Seeland as well as throughout the Danish Islands

¹ Van Cappelle, 'Nederl. Tijdschr. voor Geneesk.', 1862, iii, 506.

² Wäckerling, 'Schweiz. Zeitschr. für Medicin,' 1856, p. 164.

³ Vanthier, 'Arch. gén. de méd.,' 1848, Mai, Juin; Empis, ib., 1850, Févr., Mars.

⁴ Mazier, 'Gaz. méd. de Paris,' 1853, p. 585.

⁵ Valentin, 'L'Union méd.,' 1855, No. 105; Gaultier de Claubry, 'Mém. de l'Acad. de Méd.,' xviii, 63.

⁶ Id.

⁷ Id., ib., xix, 41.

⁸ Id.

⁹ Trousseau, 'Gaz. des hôpit.,' 1855, Nr. 86 seq.; Ouhmont, 'Revue méd.-chirurg.,' 1855, Juill; Isambert, 'Arch. gén. de méd.,' 1857, Mars, 325; Avril, 432; Gubler, ib., 1857, Mai; Fiévée, 'Gaz. des hôpit.,' 1856, Nr. 8.

¹⁰ Gaultier de Claubry, ll. cc.

¹¹ Haspel, 'Gaz. méd. de Paris,' 1855, 829.

generally.¹ In *Norway* it began to be epidemic about the same time, first in 1845 at Trondhjem,² the year after at Thoten,³ 1847 at Lavanger and Skogn,⁴ after that in the district of Namdal,⁵ while the general diffusion over the country took place in the year 1855.⁶ Lastly, for *North America* during the same years we have accounts of epidemics at Salem⁷ (New Jersey) in 1844, Philadelphia⁸ in 1845 and 1848, and in the Ohio counties of Morgan, Monroe, and Guernsey in 1847-49.⁹

§ 34. HAS BECOME A UNIVERSAL DISEASE SUBSEQUENT TO 1860 ;
ITS PRESENT AREA IN EUROPE AND AMERICA.

Although the accounts of diphtherial epidemics in former centuries, particularly in the sixteenth and seventeenth, are doubtless very imperfect, the disease having presumably been more often and more widely prevalent than the records would make out ; yet there can be no question, on the other hand, that the general spread of malignant sore-throat over a large part of the globe during the later decades of this century, was a new phenomenon in the history of pestilence, and one that loses none of its importance even if we assume, for reasons above given, that the malady had overrun wide stretches of country in the same way long before and had lasted from year to year over considerable periods. Certainly as regards our own time we have to deal with a new general outbreak of the disease ; the evidence whereof is obtained not merely from comparing the distribution-area of angina maligna as it is shown in the very complete epidemiographical data of the eighteenth century and in the not less exhaustive records of the first half of the nineteenth,

¹ See Beck, 'Bibl. for Læger,' 1849, Apr., 257, and 'Sundhedskoll. Forhandl.' for years 1848, 33 ; 1849, 29 ; 1850, 23 ; 1851, 20 ; 1852, 38 ; 1853, 68 ; 1854, 23.

² Roll, 'Norsk Mag. for Lægevidensk.,' 1848, ii, 1.

³ Raabe, *ib.*, 78.

⁴ Dietrichson, *ib.*, 73.

Jebe, *ib.*, 393.

⁵ Cold, 'Ugeskrift for Læger 1867,' Nr. 28.

⁷ Gibbon, 'Amer. Journ. of Med. Sc.,' 1845, July, 80.

⁸ Meigs, *ib.*, 1847, April, p. 277 ; 1849, April, p. 307.

⁹ Welsh, 'Ohio Med. and Surg. Journ.,' 1850, May.

with the area of the disease since about the year 1860; but it is borne out also by the almost unanimous opinion of the most experienced observers of our day, that the disease in its epidemic outbreaks came upon them as an absolutely new thing, although they may not have been unacquainted with its type. This new era in the history of angina maligna begins for the larger part of Europe and North America, at almost all points with the years 1857 and 1858, a little earlier in some countries than in others; and it is certainly a very notable thing that the time of its first appearance as an epidemic in distant parts of the world, such as India, China, Australia, Polynesia, Tunis, and the like, coincides with the outbreak in the regions mentioned. The disease showed itself, accordingly, in the form of a typical pandemic, in the strictest sense of the word. Of its starting point we can form no opinion, although there is no doubt that some parts of this great people's pestilence were dependent on other parts of it through the medium of a communicable morbid poison.

Taking up the history of angina maligna at the point where we last left it, we shall find that France, which was obviously the greatest sufferer from the malady during the last century and first half of the present, becomes again a principal seat of it in the period of the great pandemic. Next to France in the order of being invaded come the Iberian Peninsula, Holland and England; then Germany, Russia and North America; a little later the Scandinavian kingdoms; and lastly Italy and the south-east of Europe.¹

In *France*, angina maligna since 1859 had continued to spread over more and more of the country;² it was no longer confined as before mostly to the northern and eastern provinces (Brittany, Normandy, Picardy, Ile-de-France, Champagne, Lorraine, Poitou, Sologne, and the Orleanais);

¹ A complete enumeration of the epidemiographical accounts from the whole area of the malady, and covering the whole period from 1856 to the present day, would greatly exceed the space at my disposal. I must limit myself to a brief sketch of the history of the disease in the countries severally visited by it; that will suffice to give at least an impression of the whole extent of the pandemic.

² Bouillon-Lagrange, 'Gaz. hebdomadaire de médecine,' 1859, Juin, 359; Bourdel, *ib.*, 1869, Nr. 3, 41.

but it broke out in the southern and western regions also—in Burgundy,¹ the Auvergne,² the Lyonnais,³ Provence, Languedoc,⁴ Guyenne,⁵ and Saint Onge.⁶ In many of these places it presented itself, the authorities expressly tell us, as a malady unknown before; thus Bouillon-Lagrange says that in the southern part of the Dep. Seine-Oise, where he had practised for twenty years, there had been no diphtheria previous to 1857; Bodélio⁷ says the same for Morbihan, and particularly for L'Orient, the chief town of the department; according to Pitavy, diphtheria became prevalent for the first time in 1859 in the region of the Puy-de-Dôme on the borders of the Departments of the Loire and Haute-Loire (Auvergne); from Montpellier, Courty writes under date 1862 that the disease was almost unknown there before, and had become exceedingly common of late years; in Lyons⁸ down to 1865 it had been observed only in sporadic cases, but became generally diffused from that date; in St. Die (Vosges), it became epidemic for the first time in 1880.⁹

In the *Iberian Peninsula* the disease showed 'itself first in isolated cases at Lisbon in 1857 and 1858; it was not until 1859 that it grew to an epidemic, spreading gradually over a large part of the country,¹⁰ so much so that Ferraira de Macado Pinto¹¹ reckons it among the endemic maladies of Portugal. In *Spain* it began to spread likewise in 1859, until it covered the whole country;¹² but I have found only

¹ Simyan, 'Gaz. des hôpit.,' 1857, 334.

² Pitavy, 'Étude sur une épidémie de diphthérie,' Par., 1878.

³ Fonteret, 'Lyon médical,' 1868.

⁴ Courty, 'Recherches sur les conditions météorologiques de développement du croup et de la diphthérie, &c.,' Montpell., 1862; Gingibre, 'Montpellier médical,' 1866, Juin, 526.

⁵ Silva, 'Clinique Européenne,' 1859, Nr. 39; Marmisse, 'Journ. de méd. de Bordeaux,' 1868, Mars, 127.

⁶ Robert, 'Observ. d'une épidémie de croup, &c.,' Par., 1859; Borsaston, 'L'Union med.,' 1869, Mars, 23.

⁷ 'Compt. rend. des épidémies . . . de Morbihan en 1865,' Vannes, 1866, 17.

⁸ Fonteret, l. c.; Mariny et Quesnoy, 'Topogr. et statist. méd. du département du Rhône, &c.,' Lyon, 1866, 547.

⁹ Eude, 'Mém. de méd. milit.,' 1882, Juill, 352.

¹⁰ Barbosa; Gomes, 'Jornal da sociad. das sc. med. de Lisboa,' 1868 (abstract by Beer, in 'Deutsche Klinik,' 1870, Nr. 34).

¹¹ 'Medicina administrativa, &c.,' Coimbra, 1863, iii, 364.

¹² Rendu, 'Gaz. des hôpit.,' 1884, Nr. 107, 849.

casual notices of it, such as from the province of Segovia¹ in 1861-63 and from Huelva² in 1874. In *Holland* it was first seen in 1857, when there were many cases at Amsterdam; in 1858 it reappeared there as an epidemic and shortly after broke out in the provinces of Groningen, Geldern, and Friesland, about the same time on the island of Overflakke and at other points of the province of South Holland, thus gradually overrunning the whole kingdom. The mortality was comparatively small; in 1859-63 among a population averaging 3,000,000, there were only 1973 deaths reported, or about 400 per annum; in 1866-70 they numbered 2914, or a yearly average of 600. The provinces that suffered most were Gelderland, Seeland, Utrecht, Groningen, Drenthe and North Holland. In 1871 it decreased considerably, and it appears to have died out altogether in that country since 1875 or 1876.⁴

In *England*, malignant sore-throat appeared in 1857, having been imported, as was supposed, from Boulogne. The first cases were in London and the southern counties of Kent, Essex, Surrey, Sussex, Hampshire, Devon, and Cornwall; in the two years following it spread with great rapidity over the whole country as far as the Scottish border.⁴ A remission appears to have set in in 1860; but

¹ Aravaca y Torrente, 'Siglo med.,' 1864, Julio.

² Ullersperger, 'Monatsbl. für med. Statist.,' 1875, Nr. 2, 9.

³ See Donders, 'Nederl. Tijdschr. voor Geneesk.,' 1860, iv, 660; Baart de la Faille, ib., 1861, v, 1; Reilingh, ib., p. 114; Loncq, ib., p. 177; Ali Cohen, ib., p. 184; v. Cappelle, ib., 1862, vi, 565, 1863, vii, 707, 1864, viii, 689; Lobry de Brujn, 'Annal. de la soc. de méd. d'Anvers,' 1864, Févr.; Beduin, 'Nederl. Tijdschr. voor Geneesk.,' 1871, Afd. i, 357; Baum, ib., 1866, Afd. i, 193; Loysen Dillie, ib., Afd. ii, 110; 'Bevindingen en Handelingen van het geneeskundig Staatstoezicht in het Jaar 1867,' p. 194, 1868, p. 200, 1870, p. 243; 'Algemeene Statistiek van Nederland,' Leyden, 1871, ii, 163.

⁴ Hart (Ernest), 'On Diphtheria, its history, progress, symptoms, &c.,' Lond., 1859; Greenhow, 'On Diphtheria,' Lond., 1860; report in 'Trans. Epidem. Soc.,' 1860-63, i, 35; Radcliffe, ib., p. 328, and ii, 197. These are general references; the following refer to particular outbreaks: Bryden, 'Brit. Med. Journ.,' 1857, Nov., p. 967; Camps, ib., 1858, March, p. 233; Pridham, ib., April, p. 305; Atcherley, ib., June, 495; Stiles, ib., July, p. 628; Pound, ib., Sept., p. 750; Ellis, ib., 1859, May, p. 420; Rigden, ib. and 1869, April, p. 348; Cross, ib., 1859, July, p. 561; Bottomley, ib.; Jennings, ib., p. 562; Smith, ib., p. 563; ref., ib., Aug., p. 193; Prangley, ib., 1875, Jan., p. 40; Blyth, ib., Sept., p. 317; Semple, ib., Nov., p. 613; McKinder, 'Med. Times and Gaz.,' 1859, Jan., p. 32; Monckton, ib., p. 93, Feb., p. 222; Hillier, ib., Jan., p. 107; Sanderson, ib., May,

in 1863 it was still prevalent in forty-seven districts of England. For the subsequent period there do occur some references to the prevalence of the disease in England, but they represent very imperfectly the extent of its diffusion during the last twenty years; the animated discussions on the nature of the malady which have of late occupied the English medical societies would indicate that the attention of practitioners continues to be engaged with it, and that it is merely the interest in epidemiographical facts which has ceased. Regarding its epidemic prevalence in *Scotland*, there are only very meagre notices to be found. In Edinburgh, where cases of malignant sore-throat, according to Begbie's statement dating from 1862, had not been known within the previous quarter of the century, isolated cases occurred from 1858 to 1860, after which the malady increased in extent, acquiring the character of an epidemic in 1863.¹ Meanwhile there had been epidemic outbreaks in Kincardineshire² in 1859, and at Falkirk³ in 1862. While the whole number of deaths from diphtheria in Scotland was only 151 in 1861, it rose in 1862 to 285, and the year after to 478 or 1·7 per cent. of the mortality from all causes. Leith suffered most, and next to it Aberdeen and Edinburgh.⁴ For the subsequent period the only accounts of diphtheria in Scotland known to me relate to an epidemic at Letham⁵ in 1864, one at Edinburgh⁶ in 1871, and one at Auchtergaven⁷ in Perthshire in 1875.

For *Germany*, the first accounts of epidemic diphtheria for this period date from 1856, in which year the malady showed itself simultaneously at a number of places far apart—at Königsberg⁸ (where it had been prevalent, as we have

p. 373; Ballard, *ib.*, July, pp. 53, 77; Bridger, *ib.*, 1864, Aug.; McDonald, 'Lancet,' 1859, Aug., p. 183; Crighton, 'Edin. Med. Journ.,' 1860, Feb., p. 746; Downes, 'Report on an Outbreak of Diphtheria at Oaksey,' official paper, 1883.

¹ Christison, 'Edin. Med. Journ.,' 1863, Nov., p. 436.

² Forman, *ib.*, 1860, June, p. 114.

³ Hamilton, *ib.*, 1863, Aug., p. 132; Oct., p. 312.

⁴ Radcliffe, 'Transact. of the Epidemiol. Soc.,' ii, 198.

⁵ Smith, 'Edinb. Med. Journ.,' 1864, 799.

⁶ Ref., *ib.*, 1871, Sept., 287.

⁷ Yeats, *ib.*, 1876, July, 33.

⁸ Bohn, 'Königsb. med. Jahrb., i. 110; Olshausen, 'De laryngitidis membranaceae epidemia, &c.,' Regiom., 1857.

seen, in 1850-51), at several places in Holstein,¹ and in Munich and the neighbourhood,² where, however, it came to no great height. During the next five years, so far as our information goes, it was seen mostly in the southern and western parts of Germany, such as Middle Franconia³ (Bavaria), Würzburg,⁴ Munich,⁵ Rottweil⁶ (Württemberg), the Canton of Saar-Union⁷ in Alsace, and Nassau;⁸ but it occurred also in Thuringia (neighbourhood of Jena⁹), in East Frisia,¹⁰ at Bremen¹¹ and in Holstein (neighbourhood of Kiel¹²). Connecting with these scattered foci of the disease, (which have subsequently become for the most part permanent seats of diphtheria), comes the general diffusion of it over nearly all Germany in the years following. In 1862 and 1863, angina maligna was already epidemic at many places on the Baltic, such as Danzig (where I had myself opportunities of observing it as a disease that I had not seen before), Greifswald¹³ and Rostock;¹⁴ also in the Duchies,¹⁵ in the Kingdom of Saxony,¹⁶ in Thuringia,¹⁷ and in many parts of Bavaria.¹⁸ It became still more diffused in the following years; down to 1881 we have accounts of its

¹ Volquartz, 'Einige Worte über die ausschwitzende Bränne, &c.,' Altona, 1862; Krosz, 'Vierteljahrsschr. für gerichtl. Med.,' 1884, Jan., 89.

² Hauner, 'Jahrb. für Kinderheilkde.,' 1858, ii, 51.

³ Majer, 'Bayer. ärztl. Intelligenzblatt,' 1859, 477; 1860, 663.

⁴ Hofmann, *ib.*, 1881, 325.

⁵ Ranke, 'Jahrb. für Kinderheilkde.,' 1869, N. F., ii, 41.

⁶ Rapp, 'Württemb. med. Correspondenzbl.,' 1860, Nr. 18.

⁷ Ref. in 'Rec. des trav. du conseil départemental d'hyg. publ. du Bas-Rhin de 1858 cis 1859,' Strassb., 1865, 52.

⁸ Menges, 'Nass. med. Jahrb.,' 1863, Heft. 19, 20, 412.

⁹ Müller, 'Jen. Zeitschr. für Med.,' 1864, 117.

¹⁰ Köhnemann, 'Ueber Diphtheritis, deren Geschichte, &c.,' Hannov., 1862; Uhlenberg, 'Deutsche Klin.,' 1863, Nr. 50.

¹¹ Lorent, 'Jahresber. über das Gesundheitswesen . . in Bremen in den Jahren 1877-78,' Brem., 1880, 32.

¹² Bartels, 'Arch. für klin. Med.,' 1867, ii, 367.

¹³ Zielke, in 'Virchow's Arch.,' 1868, xl, 428.

¹⁴ Classen, *ib.*, 1871, lii, 260.

¹⁵ Curtze, 'Zeitschr. für Med. Chir. und Geburtsh.,' 1866, N. F. v. 259.

¹⁶ Förster, 'Prager Vierteljahrsschr. für Heilkde.,' 1864, 81; Geissler, 'Die Ausbreitung der Diphtherie im Königreiche Sachsen,' Leipz., 1880; Spengler, 'Arch. für klin. Med.,' 1883, xxxiv, 293.

¹⁷ Rohde, 'Deutsche Klin.,' 1865, Nr. 1; Kunze, 'Berl. klin. Wochenschr.,' 1866, 477.

¹⁸ See Seitz, 'Diphtherie und Croup, &c.,' Berl., 1877, 195.

prevalence in Holstein,¹ Hamburg,² Berlin and vicinity, Hanover,³ Thuringia,⁴ the Rhine districts,⁵ Hesse,⁶ Frankfurt-on-the-Main,⁷ Würtemberg,⁸ and Bavaria.⁹ In this connexion we may take the occurrence of diphtheria in Switzerland, a country, however, where it came to no great height, so far as we may conclude from the available accounts. In Demme's notice¹⁰ of a small epidemic at the children's hospital in Bern during the winter of 1866-67, it is expressly stated that no case of diphtheria had been seen outside that institution.

In the countries of the *Austro-Hungarian Empire* diphtheria does not appear to have shown itself on anything like a large scale until a later period. Besides a notice of an epidemic in the sanitary district of Wippach¹¹ (Carniola) during 1859, 1861, and 1862, the earliest account of its epidemic prevalence dates from 1870, in which year the disease appeared in the south-eastern frontier districts of Transylvania,¹² having been introduced from Roumania; it spread by degrees, but so slowly that it did not reach Hermannstadt¹³ until 1872. In 1874 an epidemic sprang up

¹ Bartels, l. c.; Bockendahl, 'Sanitätsberichte über die Provinz Schleswig-Holstein für das Jahr 1872, und ff.'; Krosz, l. c.

² 'Medicinalbericht über die med. Statistik des Hamburger Staates.'

³ Schuchardt, 'Hannov. Zeitschr. für Heilkde.,' 1866, i, 521, 1867, 293; Reinecke, 'Die Diphtheritis in Göttingen, &c.,' Göttingen, 1884, Diss.

⁴ Maulhardt, 'Berl. klin. Wochenschr.,' 1866, 498; Claes, 'Die Diphtherie in Mühlhausen in Thüringen, &c.,' Diss., Mühlh., 1870; Pfeiffer, 'Beitr. zur med. Topogr. in Thüringen,' Jena, 1873, 100.

⁵ Weber, 'Correspondenzbl. für die Mittelrhein. Aerzte,' 1868, ii, 123; Hensgen, 'Deutsche med. Wochenschr.,' 1876, No. 30 and fol.; Eschbaum, 'Beitr. zur Statistik einiger acut-entzündl. und Infectionskrankheiten,' Bonn, 1880, p. 37.

⁶ Grau, 'Journ. für Kinderkrankh.,' 1868, i, 149.

⁷ 'Jahresberichte über das Medicinalwesen . . der Stadt Frankfurt-a.-M. für das Jahr 1868,' p. 68; König, 'Berl. klin. Wochenschr.,' 1876, p. 198 (for Hanau).

⁸ Ref. in 'Württemb. med. Correspondenzbl.,' 1865, p. 182, 1867, p. 38, 185, 1869, p. 350; Ehrle, 'Pathol. der epid. Diphtheritis,' Tübingen, 1867.

⁹ See Seitz, l. c., p. 199.

¹⁰ 'Jahrb. für Kinderheilkunde,' 1868, i, 11.

¹¹ Schwegel, 'Sanitätsbericht vom Herzogth. Krain für 1861-62,' Laibach, p. 33.

¹² Gusbeth, 'Zur Geschichte der Sanitätsverhältnisse in Kronstadt,' Kronst., 1884, p. 59.

¹³ Binder, 'Wien. med. Wochenschr.,' 1873, No. 33.

in the Bukowina (Czernowitz)¹ and in Hungary,² and in 1875 the malady became epidemic for the first time in Vienna.³ In the *Russian Empire* many cases had been seen at Moscow as early as 1853; but the first accounts of epidemics in that country date from 1858 and 1859, in which years diphtheria was widely diffused,⁴ appearing at a number of places in the Government of St. Petersburg,⁵ at Moscow,⁶ and in the Government of Orel.⁷ In the southern provinces of the Empire, it occurred first in 1869 at Balta (Podolia),⁸ and from 1872 to 1879 it spread with terrible destructiveness over a great part of Southern Russia:⁹ "the victims," says Kupffer writing from Bessarabia, "were numbered in every village by the hundred, and in every commune by the thousand. The children were exterminated." It was supposed that the disease had been introduced into Southern Russia from *Roumania*, where it had shown itself for the first time in 1868 as a malady hitherto unknown, and had continued to spread without interruption until a date subsequent to 1874.¹⁰

For the *Scandinavian Kingdoms* during this period we have accounts of epidemics in *Denmark*¹¹ from 1861 to 1866; from 1861 to 1875 in *Sweden*;¹² and from 1860 to 1868 in *Norway*.¹³ In Sweden from 1863 to 1870 the cases officially

¹ Lazarus, 'Wien. med. Presse,' 1875, Nos. 38, 39.

² See 'Statist. Jahrb. für Ungarn,' 1874.

³ Stentzel, 'Wien. med. Ztg.,' 1879, Nos. 14-19; Herz, 'Wien. med. Wochenschr.,' 1879, No. 42 and fol.; Unterholzer, 'Jahrb. für Kinderheilkunde,' 1885, xxii, 311.

⁴ Ref. in 'Med. Ztg. Russl.,' 1859, p. 231.

⁵ Norden, ib., 1860, pp. 49, 57.

⁶ Kronenberg, 'Journ. für Kinderkrankh.,' 1861, xxxvi, 93; Blumenthal, 'Jahrb. für Kinderheilkde,' v, 9.

⁷ Maydell, 'Med. Ztg. Russl.,' 1860, p. 97.

⁸ Jordanoff, 'Considér. et observ. sur l'angine diphthérique,' Thèse, Paris, 1867.

⁹ Ucke, 'Vierteljahrschr. für gerichtl. Med.,' 1881, Jan., p. 158; Kupffer, 'Petersb. med. Wochenschr.,' 1882, No. 19, 20.

¹⁰ Felix, 'Wien. med. Wochenschr.,' 1870, Nr. 36; Kaléwitsch, 'Considér. sur l'épidémie d'angine diphthérique de Bukarest,' Par., 1871; Klein, 'Mémoires,' 1874, Nr. 9.

¹¹ 'Sundhedscollegiums Aarsberetninger,' l. c., and ref. in 'Journ. für Kinderkrankh.,' 1869, xxviii, 89, 95.

¹² 'Sverges Sundhedscollegii Berättelse,' år 1861-74.

¹³ Greve, 'Norsk Mag. for Laegevidensk.,' 1862, xvi, 625; Thoresen, ib., 1865,

reported numbered 18,156, of which 4176 were fatal; in Norway from 1866 to 1870 there were 9122 cases and 1649 deaths. In *Iceland* diphtheria became prevalent for the first time in 1856; it started from Reykjavik and spread in the years following over the whole island.¹ It reappeared there in 1860, having been probably introduced from the *Faröe Islands* where it was then prevalent;² and that epidemic was not extinguished until 1864.³

In the south of Europe *Italy* again became one of the chief seats of diphtheria.⁴ It appeared first at Florence in 1861, spread in the following year over a large part of Tuscany, and continued to be epidemic for more than ten years⁵ with varying range and intensity, the epidemic of 1871 being a disastrous one. At the same time as the general outbreak in Tuscany it appeared in Venetia, whence we have accounts of its being prevalent down into the seventies, at Udine, Belluno, Verona, Vicenza, and other places.⁶ Lombardy was visited by it over a wide area from 1871 onwards.⁷ In the years following it became general in the Emilia, Rome,⁸ Umbria, the Marches, Neapolitan territory,⁹ and in Sicily;¹⁰ so that in all Italy Piedmont was the only province that enjoyed something of immunity (Paroli). Corresponding to the period of its prevalence in Italy is the xix, 279; reference in 'Monatsbl. für med. Statistik,' 1874, 80 (taken from Kjerulf).

¹ Hjaltelin, 'Edinb. Med. Journ.,' 1866, May.

² 'Sundhedscollegiums Aarsberetning for 1861,' 370.

³ Finsen, 'Jagttagelser angaaende Sygdomsforholdene i Island,' Kjöbenhavn, 1874, 37. Hjaltelin does not mention this epidemic.

⁴ Compare Parola, 'Geografia nosologica dell' Italia,' Torino, 1881, 493, and Guaita, 'Lo Sperimentale,' 1882, Maggio, 449.

⁵ Morelli e Nesti, 'Istoria clin. delle difterite osservata nella città di Firenze e suoi contorni del 1862 al 1872,' Firenze, 1873; Mancini, 'Raccoglitore med.,' 1873, Nr. 25; Pierazzini, 'Annal. univ. di med.,' 1880, 254, 464.

⁶ Tamborlini, 'Gaz. med. Lombard.,' 1873, 231; de Sabbata, 'Osservaz. della difteria,' Udine 1879; Facen, l. c.; Bubola, 'Gaz. med. Veneta,' 1864; Donati, 'Annal. univ. di med.,' 1874, Gennaio, 3; Agostini, l. c.

⁷ Commissionsbericht in 'Annal. univ. di med.,' 1874, Settembr., 647; Calimani, 'Gaz. med. Lombard.,' 1875, 409; Dell' Acqua, ib., 1876, 201; Mascherpa, ib., 301; Casali, ib., 441.

⁸ Aitken, 'Brit. Med. Journ.,' 1873, March, 341.

⁹ Menzies, 'Edinb. Med. Journ.,' 1872, Sept., 217; ref. in 'Gaz. med. Lombard.,' 1876, 402.

¹⁰ Parola, l. c.

epidemic outbreak of diphtheria in *Malta*.¹ In *Greece* it had already made an appearance—its first—in 1865, in the Epharchy of Phthiotis (Hellas), where it has continued to be endemic.² In many parts of *Turkey*, also, it was prevalent in 1868-71.³

In *North America*, just as in Europe, diphtheria has come to be generally diffused since the year 1856. The first accounts of it come from California⁴ and the State of New York.⁵ Soon after it appeared in the New England States (Connecticut,⁶ Providence, Massachusetts, Vermont,⁷ and Rhode Island⁸); in Pennsylvania (particularly Philadelphia⁹), New Jersey,¹⁰ and Virginia;¹¹ then in the Prairie States (Indiana¹² and Illinois¹³), Mississippi¹⁴ and Louisiana (New Orleans¹⁵); and, lastly, in the north-western territories (Kansas,¹⁶ Minnesota,¹⁷ and Oregon¹⁸). Wherever in this wide area the malady

¹ Gulia, 'Notizie clin. sulla difteria,' Malta, 1870.

² Rizopoulos, 'Congrès des médecins Grecs à Athènes en 1882,' Constantinople, 1883, 17; Valassopoulos, *ib.*, 22.

³ Marroin, 'Arch. de méd. nav.,' 1869, Octbr., 308, Decbr., 461; *ref. in* 'Gaz. méd. d'Orient,' 1873, 155; Mauricos, *ib.*, 1876, 10.

⁴ Gibbons, 'Annual Address before the Francisco Med. Soc.,' 1857; Fourgeaud, 'Diphtheritis: a concise history and critical essay, &c.,' Sacramento, 1858; Whitney in 'Transact. of the California State Med. Soc.,' 1858; Blake, 'Pacific Med. and Surg. Journ.,' 1858, Aug.; Logan in 'Dobell's Reports,' 1871, ii.

⁵ Willard, 'Transact. of the New York State Med. Soc.,' 1858; Chapman, 'Boston Med. and Surg. Journ.,' 1863, Feb.; Jacobi, 'Journ. für Kinderkrankh.,' 1861, xxxvi, 153, and 'Treatise on Diphtheria,' New York, 1880; Bowditch, 'Transact. of the Amer. Med. Assoc.,' 1878, xxix, 585; 'Second Annual Report of the State Board of Health of New York,' 1882, 4.

⁶ Beandley, 'Boston Med. and Surg. Journ.,' 1859, 87, 439; Matthewson, 'Communications of the Connecticut State Med. Soc.,' 1865, 132.

⁷ *Ref. in* 'Lancet,' 1863, i, 222; Stevens, 'Transact. of the Vermont State Med. Soc.,' 1865.

⁸ Parsons, 'Transact. of the Amer. Med. Assoc.,' 1865, 132.

⁹ Jewell, 'Amer. Journ. of Med. Sc.,' 1860, April, 390; Keller, *ib.*, July, 125; Read, *ib.*, 1861, Jan., 138; Jewell, *ib.*, July, 76, and 1864, July, 107; references in 'Transact. of the Pennsylvania State Med. Soc.,' 1862-77.

¹⁰ Ryerson, 'Trans. of the New Jersey State Med. Soc.,' 1859, 5, and 1861, 27.

¹¹ Le Cato, 'Amer. Journ. of Med. Sc.,' 1865, July, 44.

¹² Brower, 'Transact. of the Indiana State Med. Soc.,' 1860.

¹³ 'Report of the Board of Health of the City of Chicago,' 1871.

¹⁴ Williamson, 'Amer. Journ. of Med. Sc.,' 1860, July, 99; Goldsmith, *ib.*, 1861, April, 392.

¹⁵ Chaillé, 'New Orleans Med. Journ.,' 1870, July, 576.

¹⁶ Brock, 'Transact. of the Kansas State Med. Soc.,' 1867.

¹⁷ Hutton, 'New York Med. Record,' 1884, March, 3, 6.

¹⁸ Gisan, 'Amer. Journ. of Med. Sc.,' 1865, Jan., 78.

got a footing it lasted a number of years, becoming more general and more virulent in some seasons and places than in others. For the last ten years the epidemiographical notices of it are certainly no more than occasional; but in that country, just as in England, Germany, France, and the other great States of Europe, "diphtheria" forms a standing article in the medical journals; and we must explain the absence of chronicled epidemics not so much by any decline of the disease as by the failing interest in the epidemiographical facts. It remains to add that diphtheria in North America has by no means been confined to the United States; it occurred in *Nova Scotia*¹ in 1861, in *Newfoundland*² and *Prince Edward's Island*³ in 1867; and since 1864 it has been in *Mexico*,⁴ where Heinemann tells us (writing from Vera Cruz⁵) that it carries off many victims every year.

§ 35. PREVALENCE IN OTHER PARTS OF THE WORLD.

The conception of a universal epidemic which we get from the foregoing sketch of the history and geography of diphtheria on European and North American soil, comes out still more decidedly when we turn to the history of the disease during the same period in many other parts of the globe.

Thus, we have accounts of the epidemic prevalence of malignant sore-throat in the *West Indies*,—at Havana⁶ in 1850 and 1853, on St. Thomas⁷ in 1858 and 1859, on Martinique and Guadeloupe⁸ in 1859 and 1860; and in the *Bermudas*⁹ during the same period (1858 and 1862). While there is

¹ Dupont, 'Notes et observ. méd. sur la côte orientale d'Amérique,' Montp., 1868, 79.

² Anderson, in 'Dobell's Reports,' 1870, 365.

³ Hobkirk, *ib.*, 414.

⁴ Coindet, 'Gaz. hebdom.,' 1864, 376.

⁵ 'Virchow's Archiv,' 1873, lviii, 177.

⁶ Grande-Boulogne, 'Revue de Thérap.,' 1860, Févr.

⁷ 'Sundhedscollegiums Aarsberetning' for 1858, p. 430; 1859, p. 436.

⁸ Brassac, 'Considér. pathol. sur les pays chauds,' Montp., 1863, and 'Congrès internat. de médecins des colonies,' Amsterd., 1884, p. 320; Carpentin, 'Arch. de méd. nav.,' 1873, Dec., p. 433.

⁹ Smart, 'Trans. Epidem. Soc.,' 1867, ii, 286; 'Statist. Report of the British Army,' 1862, p. 61.

nothing said of it in the earlier medical accounts from *Guiana*, it counts at present among the diseases of common occurrence there.¹ In Buenos Ayres (*Argentine Republic*), where angina maligna had been epidemic in 1814-23,² it has become since 1863 one of the standing diseases.³ In *Peru*, where the malady, according to Tschudi,⁴ is seen particularly often on the coast and in the forest region ("montana"), having been seen first at Lima in 1821,⁵ it attained its wider epidemic diffusion in the year 1850, and from 1855 to 1859; in the latter period it spread southwards from Piura to Trujillo and Huaco, reaching Lima in February, 1858.⁶

Of the history of diphtheria in Africa we have but scanty accounts, some of which are untrustworthy as well. In *Senegambia* and on the *West Coast* the malady would seem to have occurred hitherto in rare and sporadic cases only, if it has occurred at all.⁷ On the other hand, it is often met with in *South Africa*,⁸ particularly on the plateau of the Orange Free State; at the beginning of 1866 there was an epidemic of it in Caffraria.⁹ On the *East Coast of Africa* the disease would appear to have become indigenous since 1837,¹⁰ after importation, it is conjectured, from Natal. In *Réunion*,¹¹ also, it would seem to be common, an epidemic being recorded for 1839.¹² On the other hand, in *Madagascar*¹³ and the adjoining island of *Nossi-Bé*,¹⁴ only sporadic cases are seen from time to time. In *St. Helena*, also, nothing has been heard of the malady since 1824, in which year it was epidemic.¹⁵

¹ Lange, 'De la diphthérie,' Montp., 1869, p. 49.

² Mantegazza, 'Lettre mediche sulla America meridionale,' Milano, 1860, i, 329.

³ Seitz, l. c., p. 267 (from private correspondence).

⁴ 'Oester. med. Wochenschr.,' 1846, p. 446.

⁵ An account of this epidemic is given by Valdes in a work published in 1827, which I am not acquainted with.

⁶ Odriozola, 'Amer. Journ. of Med. Sc.,' 1858, Oct., p. 520 (from 'Gazetta med. di Lima,' 1858, July); Smith, 'Trans. Epid. Soc.,' 1863, i, 365.

⁷ Borius, 'Arch. de méd. nav.,' 1882, Mai, p. 370.

⁸ Fritsch, 'Arch. für Anat. und Physiol.,' 1867, p. 733.

⁹ Lawson, 'Trans. Epid. Soc.,' 1869, iii, 141.

¹⁰ Roquete, 'Arch. de méd. nav.,' 1868, Mars, p. 167.

¹¹ Oelsner, 'Monatsschr. der Berl. geogr. Gesellsch.,' N. F., iv, 275.

¹² Dussac, 'Séance publ. de la Soc. de méd. de Toulouse,' 1841, p. 70.

¹³ Borchgrevink, 'Norsk Mag. for Laegevidensk.,' 1872, p. 234.

¹⁴ Deblenne, 'Essai de géogr. méd. de l'île de Nossi-Bé,' Paris, 1883, p. 163.

¹⁵ McRitchie, 'Trans. Calcutta Med. Soc.,' 1838, viii, App. xxix.

Whether it is at present so rare in Egypt as Pruner found it to be twenty-five years ago¹ is questionable. In *Tunis* from 1872 to 1876 the disease was epidemic over a wide area and very malignant,² and in 1882 it was seen there again among the French soldiers garrisoning the country, having been introduced from Algiers.³ Among the natives of Kabylia (*Algiers*), Bazille⁴ had never seen angina maligna; but against that statement there is to be set Gaucher's⁵ account of a severe epidemic in 1865 in the settlement of St. Cloud, situated between Algiers and Oran; and it follows, from the fact just mentioned of the introduction of the malady into Tunis in 1882, that Algiers had been visited by it in that year also.

As regards the occurrence of diphtheria in *Asia*, we have only a few trustworthy accounts; but these possess a high interest for the recent history of the malady and for establishing its character as a world-wide sickness. In *Smyrna* it was epidemic for the first time in 1865; since that date it has extended widely over *Asia Minor* and has raged disastrously time after time at many places.⁶ In *Syria* the malady would appear to have been unknown down to 1868.⁷ From that country there are no later accounts; but from *Fars* in *Persia* we hear of a first outbreak there in 1874, and of the spread of the disease from that point over the whole of *Persia* in disastrous epidemics during the years following down to 1878.⁸ In *India* several epidemics of malignant sore-throat had been observed as early as the beginning of the century; a notice in a paper by McGregor on diseases occurring in *Bombay* in the year 1800, seems to relate to one such

¹ L. c., p. 206.

² Ferrini, 'Lo Sperimentale,' 1874, Luglio, 11, Settbr., 288; 'Annali univ. di med.,' 1875, Maggio, p. 193, ib., 1877, Marzo, p. 254, and Aprile, p. 323; Fusaro, 'Storia d'una epidemia di difterite osservata in Susa di Tunisi,' Livorno, 1876.

³ Maljean, 'Arch de méd. milit.,' 1884, No. 5, p. 195; Fricourt, 'Arch. de méd. nav.,' 1884, Juill, p. 16.

⁴ 'Gaz. méd. de l'Algérie,' 1868, p. 29.

⁵ Ib., 1869, p. 24.

⁶ Latris, 'Congrès des médecins Grec à Athènes, 1882,' Constantinople, 1883, p. 139. See also Scherzer, 'Smyrna,' Wien, 1873, p. 31.

⁷ Post, 'New York Med. Record,' 1868, June, p. 149.

⁸ Tholozan, 'Gaz. hebdomadaire de méd.,' 1878, pp. 491, 520.

epidemic ;¹ Jackson² says that in 1833 a few cases of angina maligna, some of them fatal, occurred in a family which had arrived in Calcutta from the Upper Provinces, and that the malady was prevalent in that city two or three years after (1836) in a girls' school. For the more recent period in India we have accounts of an epidemic of malignant sore-throat in 1856 in a village on the slope of the Himalaya at an elevation of 6450 feet ;³ and of numerous cases in Fort St. George (Madras) in 1863.⁴

From the *Malay Archipelago* there is a record of an epidemic of diphtheria in Sourabaya and Batavia in 1881,⁵ and from *Cochin China* of an epidemic among the French garrison at Fort Tongkeong in 1864 ;⁶ it is stated also by Laure⁷ that angina maligna was very common in the French fleet from 1859-62 in the China and Cochin China seas, that in one ship it was epidemic, and that the same fate overtook the crew of a United States ship-of-war cruising in Chinese waters.⁸ In the northern provinces of China (according to Dudgeon), and at Peking in particular, the malady would seem to have been endemic since 1821 ; there was a frightful epidemic of it in the beginning of 1866, the number of deaths in Peking being estimated at 25,000. We have no means of knowing how far it extends in those parts ; but we may conclude from statements made that it has been epidemic several times since 1866.⁹ In the reports by English practitioners in the southern ports of China, it is expressly said that diphtheria does not occur in them. In *Japan*, previous to 1877, sporadic cases had been seen ; in that year

¹ 'Edin. Med. and Surg. Journ.,' 1805, July, p. 282 : "Though the croup was very prevalent in the town and in the island of Bombay in September, October, and November, and though several adults died of it, yet no case appeared among the women, children, or men of the regiment."

² 'Trans. Epid. Soc.,' 1860, i, 65.

³ Francis, 'Ind. Annals of Med. Sc.,' 1860, Nov., p. 9.

⁴ Chipperfield, 'Madras Quart. Journ. of Med. Sc.,' 1863, April, p. 427.

⁵ Schneider, 'Geneesk. Tijdschr. voor Nederl. Indie,' 1881, x, Afl. 2, p. 129 ; v. d. Wiel, ib., p. 303.

⁶ Lange, 'De la diphthérie. Relation d'une épidémie de cette maladie observée à Tong-Keon,' Montp., 1869.

⁷ 'Hist. méd. de la marine française, &c.,' Par., 1864, 15.

⁸ Gray, 'Amer. Journ. of Med. Sc.,' 1873, Jan., 80.

⁹ Morache, 'Annal. d'hyg.,' 1870, Janv., 57 ; Gray, l. c. ; 'Leudesdorf's Nachrichten,' 1875, ix, 15 ; Dudgeon, 'Glasgow Med. Journ.,' 1877, July, 321.

the disease became epidemic for the first time at Yokohama,¹ where Baelz saw many cases of it again in 1881 and 1882.²

Lastly, as regards *Australia*: Previous to 1837, there had been, according to Dempster,³ occasional epidemics of a malignant kind of sore-throat; but the more general outbreak of diphtheria on the mainland dates from 1858-59. Whether the epidemic had come from Tasmania, as was thought,⁴ and thereafter traversed the colonies of the southern littoral, seems to be doubtful; it is certain, however, that the number of cases and deaths from diphtheria from 1859-61 was very considerable in Melbourne (Victoria), and that the mortality from it there as well as in Sydney and Adelaide has formed no small fraction of the total deaths in subsequent years (verified down to 1875). There was an outbreak in Tasmania in January, 1859, at two places in the interior simultaneously;⁵ the epidemic seems to have lasted a considerable time, but no trustworthy information about it has come to my knowledge. It may be that the cases at New Plymouth, province of Taranaki in the Northern Island of *New Zealand*, in the year 1861 had some connexion with the diphtheria which was prevalent at the places in Australia above mentioned.⁶

§ 36. MOSTLY A DISEASE OF COLD WEATHER; MANY EXCEPTIONS.

The history of diphtheria shows that the malady has been prevalent under all *circumstances of climate*, in the highest as well as in the lowest latitudes, on the coast as well as in the interior, and always of the same type and of the same kind of malignancy. At the same time its predominance in the temperate and cold zones compared with its rarity in the

¹ Godet, 'Étude sur l'hygiène au Japon,' Par., 1880, 62; Scheube, in 'Virchow's Arch.,' 1885, Bd. 99, 371.

² 'Infectionskrankheiten in Japan,' Yokohama, 1882, 5.

³ 'Transact. of the Calcutta Med. Soc.,' 1837, vii, 357.

⁴ See in 'Transact. of the Epidemiol. Soc.,' 1860, i, 8, and in 'Lancet,' 1872, Nov., 639; 'Leudesdorf's Nachrichten,' 1874, viii, 78; 1875, ix, 51; 1877, xi, 49.

⁵ Moore, 'Brit. Med. Journ.,' 1859, Oct., 857 ('Australian Med. Journ.,' 1859, July); Hall, 'Transact. of the Epidemiol. Soc.,' 1865, ii, 73.

⁶ 'Med. Times and Gaz.,' 1862, April.

equatorial and subtropical regions, is great enough to be significant, even if we assume that these differences are only in part real and in part to be accounted for by the defective data from countries of the latter class, and that a more intimate acquaintance with them than we now possess might show a not inconsiderable extension of the area of angina maligna.

An approximate means of estimating the dependence of the disease, as regards extent and frequency, upon the meteorological characteristics of the climate may be got from the relation of the sickness to influences of *season* and *weather*. In 124 epidemics of which we have exact data regarding their duration, all of them being closely circumscribed in place and of no more than a few months' continuance, the outbreaks reached their height as follows :

32 in the Spring. ... 30 in the Autumn.
24 „ „ Summer. ... 38 „ „ Winter.

A result closely corresponding to that is got from the statistics of sickness and death from diphtheria at various places over longer periods of time :

*Table of the proportions of Diphtheria in the several seasons.*¹

	Period.	Season. ²			
		Jan.—Mar.	Ap.—June.	July—Sept.	Oct.—Dec.
Sweden ³	1861-70	31'0	20'9	19'0	29'1
Berlin ⁴	1876-83	24'2	21'4	22'1	32'3
Saxony ⁵	1873-78	28'7	17'6	17'7	36'0
Hamburg ⁶	1873-82	23'9	24'2	21'7	30'2
Göttingen ⁷	1878-82	33'5	22'4	19'5	24'5
Schleswig-Holstein ⁸	1872-81	29'6	20'0	22'0	28'4
St. Petersburg ⁹	1878-82	24'7	23'1	20'9	32'3
Frankfurt-a.-M. ¹⁰	1863-83	27'3	24'7	19'6	28'4
Vienna ¹¹	1863-83	31'3	23'5	15'7	29'5
Philadelphia ¹²	1868-75	24'0	21'4	18'5	37'1

¹ In the first line of the Table (Sweden), the percentages are of all cases of diphtheria; in the rest they are of the fatal cases only.

² As the figures for several of the localities are given only for quarters of the year, I have been obliged to reduce those which are given for the several months to the same denomination.

³ 'Sveriges Sundhedscollégii Berättelse.'

⁴ 'Statist. Jahrbuch für die Stadt Berlin.'

⁵ Geissler, l. c.

⁶ 'Berichte des Medicinalinspectorats der Stadt Hamburg.'

⁷ Reinecke.

⁸ Bockendahl, 'Sanitäts-berichte für die Provinz Schleswig-Holstein.'

⁹ Senetz, 'Petersb. med. Wochenschr.,' 1883.

¹⁰ 'Statist. Mittheil. über die Gesundheitsverhältnisse der Stadt Frankfurt-a.-M.'

¹¹ Monti, 'Ueber Croup und Diphtherie,' Wien, 1884, p. 135.

¹² 'Transact. of the Pennsylvania State Med. Soc.,' 1876, p. 290.

According to this table the maximum of sickness at all the points of observation occurs in the colder months, and the minimum in the warmer.¹ It is in keeping therewith that in many epidemics an increase of the disease-area and in the number of cases has been found to take place under the influence of cold and wet weather. Thus Bourgeois observed at St. Denis in 1827 a striking change in the cases for the worse when cold and damp weather set in. Speaking of the epidemic of 1844 at Salem, New Jersey, Gibbon says: "Not unfrequently the disease, after having almost subsided, would be aggravated by changes in the weather; an unusually damp atmosphere almost invariably aggravated the symptoms, while a few days of clear, dry weather almost as invariably diminished their violence." According to Mazier's observations of the epidemic of 1850-51 in the Dep. Orne, great changes of temperature always brought an accession of the disease; and there are similar statements as to the influence of cold and damp weather in giving the epidemic a fresh impulse, reported from Paris in 1855, Würzburg and Sardis (Missouri) in 1860, and from Loncq in Holland in 1860.

These facts are deserving of all attention; but in judging of the effects which this particular kind of weather seems to exert on the amount and character of the malady, we cannot leave out of account the following considerations:

(1) That in a very large number of cases the epidemic, once it was developed and had lasted some time, has gone on quite regardless of changes in the season and weather.

Thus, to give only a few of the facts, it is stated by Bouillon-Lagrange with reference to the epidemic of 1857-58 in the department of Seine-Oise, that the disease kept a uniform type under all kinds of weather; and Daviot says the same of the epidemic of 1841-44 in the departments of Saône-Loire and Nièvre. Tueffert observes that the malady during the epidemic of 1863 in Etupes was just as widely spread in the hot and dry month of August as in the damp and cold month of February. According to McKinder, the epidemic at Gainsborough continued from 1857 to 1858 without its type being influenced in any way by changes

¹ It should be borne in mind, however, that these figures are without doubt vitiated in several instances by the inclusion of genuine cases of croup; and as the latter belong pre-eminently to the colder months, the ratios where they are included in the above table would be excessive for diphtheria.

in the weather. Maulhardt found that the disease during the epidemic of 1865-66 at Treffurt had quite the same character in mild as in rough weather. Grau says that the epidemic in Sontra and vicinity from 1864 to 1866 underwent accessions, "sometimes under great cold and snow, sometimes in dry and warm weather, and sometimes when the atmosphere was cool and charged with rain." From observations by Morelli and Nesti, the disease in Tuscany from 1862 to 1872 had been equally prevalent at all seasons, and in all kinds of weather. Jewell¹ says of the Philadelphia epidemic in 1863: "We are quite certain that neither the heat of summer nor the cold of winter has exerted any influence in abating its destructive attacks." In the epidemic from 1874 to 1878 in Persia, the disease broke out at the beginning of August, 1874, in Shiraz (29° N., or within a few degrees of the tropic); in the spring of 1876 at Ispahan, Tauris, Teheran, &c.; in the beginning of summer at Khum; in autumn at Asterabad, Kermanshahan, &c.; and in the winter of 1877-78 in Persian Transcaucasia.

(2) That the climax of the epidemic has very often been reached not merely at the time of warm and dry weather, but even in the season of maximum high temperatures, or in the hot summer months; it is precisely in tropical regions where that circumstance has been particularly often noted, some observers going so far as to conclude from their experiences that a rising temperature exerts an influence favorable to the development and growth of the epidemic.

In the Paris epidemic of 1841, the number of cases increased as the season advanced towards summer, Becquerel's conclusion from his then experiences being, "*que les jours qui ont marqué le début des trois formes de la maladie ont presque toujours présenté une haute température, soit absolue, soit relative pour les mois dans lesquels on les observait.*" In like manner Bodélio says of the epidemic of 1865 in Morbihan: "*L'hiver heureusement a mis à-peu-près fin à cette affection, qui semble n'avoir été que le résultat des fortes chaleurs de l'été.*" Wooster² has the following concerning the kind of weather during the prevalence of diphtheria in California in 1856: "In our climate the air in summer becomes so dry that if an ordinary soft wooden pail or bucket be half filled with water and set in the sun in the open air for six hours, and then two quarts of water be added, it will leak through the joints of the shrunken staves above the surface of the first portion of water. . . . This is the kind of air in which the disease has occurred with unequalled fatality in this State." In Algiers diphtheria was prevalent in 1865 from March to July during very hot and moist weather; in Tanis from May to August, 1882; in Guadeloupe from August to

¹ 'Amer. Journ. of Med. Sc.,' 1864, July, p. 108.

² Quoted by Slade, 'Amer. Journ. Med. Sc.,' 1861, Jan., p. 305.

November, 1860; in Cochin China during September and October, 1864; and in the Bermudas mostly during the hot season. At Vera Cruz, according to Heinemann, the prevalence of the disease is not associated with any one season more than another.

From these facts there are good reasons for thinking that the circumstances of the season and the unfavorable weather associated therewith, are without direct influence on the production of the malady; and that they are of consequence merely as predisposing causes, in so far as they increase the susceptibility of the individual, either by exciting the particular mucous membrane which the disease is afterwards to attack, namely, the mucous membrane of the throat, or, still more potently perhaps, by bringing about an untoward state of the hygienic conditions amidst which the individual lives.

§ 37. ALTITUDE AND SOIL IRRELEVANT.

The assumption that *conditions of the soil* have some influence on the development of diphtheria or on its epidemic diffusion, is one that has no warrant. The disease has been as prevalent in elevated as in low-lying places, in mountain regions as on the level ground, on plains as in valleys, on dry as on wet soil, on the most various geological formations, on porous and on hard rock equally. Nowhere has the non-dependence of the disease on such conditions as these come out more prominently than in the comparatively quick and considerable diffusion which it reached in England. The observations of Semple, Sanderson, Bottomley, and others are thus summed up and endorsed by Ernest Hart:¹

“Was a connexion traced between the localities of its invasions and the marshy ill-drained character of the land, the next season it was found to ravage dry and elevated stations with equal rage. . . . Brighton has not escaped, Scarborough has suffered, it has swept across the marshy lowlands of Essex and the bleak moors of Yorkshire that are swept by the sea breezes; it has seated itself on the banks of

¹ ‘On Diphtheria: its history, progress, symptoms, treatment, and prevention,’ Lond., 1859.

the Thames, scaled the romantic heights of North Wales, and has descended into the Cornish mines."

The same view has been taken by later authorities in England such as Fosbroke, who says that "geological position has little, if any, connexion with the disease;" and the experiences of France, Germany, Holland, Italy, and the United States have been similar. The idea of a damp soil being conducive to the development of diphtheria is contradicted by experience in New Jersey, and in New York (where the disease was as prevalent in elevated and dry localities as in low and damp), as well as by the observations made in 1862 in Pennsylvania, where the malady was much less prevalent in the valleys and along the course of the Delaware than at elevated places in a dry situation. Van Cappelle,¹ writing of the epidemics in Holland from 1859 to 1861, says: "Just as in England, the sickness was met with under no special conditions of locality; it occurred equally on sand and on loam, on high ground as well as on low moors." In Malta, as Gulia tells us, many low and damp places escaped, while elevated, dry and breezy localities were devastated. That diphtheria can penetrate even to very considerable elevations is shown by the experiences of the Himalayan slope in India and of the montana-region in Peru.

How little it is associated with any one geological formation or excluded from any, will be seen by a glance at its distribution-area.

Geissler, in his history of diphtheria in the Kingdom of Saxony, (l. c., p. 39) says: "That any particular character of soil has afforded protection against the spread of the malady can nowhere be made out.

. . . The basalt has saved neither Stolpen nor Oberwiesenthal, nor has the porphyry given protection to the vicinity of Grimma; equally little have the gneiss and the mica-schist conferred immunity on the Metal Mountains, or greenstone and clay-slate on the Voigtland."

Lastly, it has to be said that diphtheria has broken out several times on board ship, and has become epidemic among the ship's company; that it is say, under circumstances where there could be no idea whatever of an

¹ L. c., 1862, p. 589.

influence exerted by conditions of the soil. Facts of that kind have been given already in referring to the observations made on board ships-of-war cruising in Indian and Chinese waters. To these may be added the account by Lajartre¹ of numerous very malignant cases of diphtheria on board a French ship-of-war during a seven months' voyage from L'Orient to China; also the narrative by Mackay² of the disease on board an English ship-of-war in the harbour of Rio de Janeiro: besides a number of slighter cases which affected both officers and men, there was one severe case in a midshipman, on whom Mackay had to perform tracheotomy and caught the disease himself from sucking out the tube.

§ 38. NO RACIAL IMMUNITY.

Whether some races are specially predisposed to take diphtheria, while others enjoy a pronounced immunity from it, cannot be decided for certain with the scanty information that we possess relating to epidemics in localities where the population is a mixed one. The statement of Odriozla, that the negro race in Peru is as much protected against diphtheria as it is against yellow fever, is contradicted by Tschudi, who says that it is just the children of the negroes in that country who suffer most from malignant sore-throat; an opinion which has found support in the experience of Goldsmith at Oakland, Missouri, and of Smart in the Bermudas. The inference drawn from the exemption of the Chinese during the epidemic in Victoria (Australia), that the Mongolian race has immunity, is just as little warranted in fact; for the disease, as we have seen, is very widely diffused and very malignant in the northern provinces of China, and it has not spared the natives of Japan.

¹ 'Considerations sur l'état sanitaire de la fregatte l'Andromaque,' Paris, 1866.

² 'Trans. Epid. Soc.,' 1860, i, 63.

§ 39. QUESTION OF ITS DEPENDENCE ON INSANITARY CONDITIONS.

The question of the influence exerted by *insanitary conditions* upon the occurrence and epidemic diffusion of diphtheria has been a subject of much controversy. Many observers have found evidence in their own experience that this malady, like other infective processes, is materially influenced by such etiological factors, if not in its origination yet in the extent and virulence of its manifestations; that the disease occurs chiefly and in largest amount where organic decomposition-products offer to the special morbid cause a suitable soil for its development or its reproduction, or, where they so affect the human organism as to predispose to the disease. The accumulation, therefore, of animal or vegetable exuviae in or upon the soil around dwellings or within them, the overcrowding of rooms along with want of cleanliness and ventilation, or other such insanitary state of things, would be circumstances particularly favorable to the creation of disease-foci; and in accordance therewith is the fact that diphtheria, like other infective diseases, takes most of its victims from those classes of the population which are most exposed to the these noxious influences, namely, the poorer working classes and the proletariat. This view of the matter, held by many English, German, French and American practitioners, has found definite expression in the essay by Hart:

"Zymotic disease is mostly bred by poverty out of uncleanness, and diphtheria follows a general law of what may be called the phytogenesis of zymotic poisons in this respect. It takes up its abode by preference in the hovels of the poor, where the stagnant and pent-up air reeks with animal effluvia—where human beings and domestic animals 'pig' together; above all—and this is the centre toward which all sanitary precautions should ever tend—where the poisonous cesspool and the unflushed privy taint the air with subtle effluvia, that seize their victims by the throat and bring death with their foul touch. The extreme tendency to limited action, which marks these epidemics, and which was fully illustrated in the French epidemics, as it has been also in the English, indicates the presence of domestic predisposing causes, amongst which we rank these obnoxious nuisances as of prime activity."

Against that theory, or rather against the reading of the facts on which it rests, there have been more or less serious objections raised from another side. A section of the observers declare that they have found no positive evidence in their own experience in favour of that doctrine; thus, Bowditch says of the epidemic of 1877 around Lake Champlain, "if this epidemic does not prove the value of cleanliness in warding off diphtheria it does not oppose that idea."

Another section, however, are decidedly of opinion that diphtheria grows to an epidemic just as often apart from the noxious influences in question, those very localities and those classes of the people escaping its epidemic inroads in which the insanitary state of things had been most pronounced. Trousseau, one of the earliest and most distinguished writers on diphtheria, had long ago said: "Dans des bourgs et des hameaux du département du Loiret, remarquables par leur salubrité et leur bonne position géographique, je voyais la diphthérie sévir avec une horrible violence, et des villages de la Sologne, situés au milieu de marais, rester exempts de fléau;" and the same was observed in the epidemic of 1853 in the arrondissement of Valenciennes. Thoresen says,¹ in his account of the 1861 epidemic of malignant sore-throat in Norway: "That bad sanitary conditions, such as unwholesome, damp, dingy and cramped dwellings, can add to the malignancy of the disease I do not wish to deny; but that it may be seen breaking out and assuming the worst type under circumstances the most favorable, while in small and poverty-stricken huts it runs a perfectly mild course—of that I have been convinced time after time." In an epitome of the epidemics in England from 1859-72, we read that "diphtheria was more fatal in the healthy districts than in all England."² That dampness of the soil, filth, want of fresh air, and over-crowding do not come into account in the estimate of its causes in the valleys of the Bavarian Highlands, will be admitted, says Beckler,³ by everyone who knows the farms and small villages of that region. With reference to the incidence of the malady among the well-to-

¹ L. c., p. 285.

² 'Thirty-Fifth Annual Report of the Registrar-General,' 1875, App. xxix.

³ 'Bayer ärztl. Intelligenzbl.,' 1868, No. 47, p. 614.

do and the necessitous classes respectively, Ramsey had long ago remarked, concerning the epidemic of 1793 in Chesham, that there was no material difference in the number of cases among the rich and among the poor; and the same fact is vouched for by McKinder for Gainsborough, Ballard for Islington, Years for Perthshire, Morelli and Nesti for Tuscany, Trezzi (as reporter of the Milan Sanitary Commission) for the province of Milan, Barbosa for Lisbon, Maydell for the Government of Orel, Chapman for New York, and Jewell¹ for Philadelphia. In v. Cappelle's account² of the epidemic of 1859-61 in Holland, it is stated: "At one place it was mostly the poor, and generally speaking those living under less favorable sanitary conditions, who were attacked by the disease; while, at another place, it was exclusively the well-to-do." Speaking of diphtheria in Munich, Seitz says: "Thus we see that the disease has existed for years here among all circles of the inhabitants both rich and poor, in families belonging to the aristocracy as well as in those belonging to the working class."

Summing up the experiences of the Kingdom of Saxony in the matter before us, Geissler says: "It would be, indeed, labour lost to seek for the source, or at all events the nourishing soil of diphtheria, in filth and want of cleanliness. The much abused phrase 'social misery,' which comes to the front regularly whenever etiology is at its wit's end, is misapplied in the case of diphtheria. Even our sanitary officials make express reference in their reports to the frequent occurrence of this malady under the most favorable surroundings, therein confirming the earlier statements of many impartial practitioners in other countries." It is well known that diphtheria has not spared the most exalted members of society, and that it has on several occasions thrown princely houses into mourning. In by no means rare instances, the number of the sick has been considerably greater among the well-to-do classes than among the proletariat; thus, according to Neucourt's account of the epidemic at Verdun in 1850, the cases among the well-off part of the inhabitants exceeded those among the poor in the ratio of

¹ L. c., April, 1862, p. 376; October, 1864, p. 107.

² L. c., p. 589.

15 to 4 ; of the epidemic at St. Mary Cray in 1859, Heckstall Smith says : " Cases have occurred in all ranks of life, but in a very much larger proportion amongst the middle and upper ranks than amongst the poor ; the exemption of the pauper class is remarkable ;" and to the same effect Odrizola writes from Lima : " It was natural to expect that the disease, on making its appearance in our locality, would find most of its victims among the poorer classes of the people, as it had done in many parts of Europe where it had raged with equal virulence. But the result was just the opposite,—it was mostly those who enjoyed all the conveniences of living that took ill ; and that preference was so marked that in the hospital for men not a single case of diphtheria occurred, and only two cases of the disease were received into the Santa Anna hospital for women."

Lastly, to aid in deciding the question before us, I shall call attention to the fact that in several of the epidemics in the United States, the negro children, who live under the most unfavorable conditions, have enjoyed a striking immunity from the disease. Noteworthy also is the remark of Felix concerning the epidemic of 1868-69 in Bukharest : " It is a striking thing that the Jewish population of the city (more than 14,000 in number) have remained almost exempt from the epidemic, notwithstanding the bad sanitary conditions under which most of them live."

Without wishing to make too little of these and many other observations of the same kind brought forward against the theory of the zymotic origin, if one may so call it, of diphtheria, I still think that insanitary conditions are not without importance for its existence and epidemic diffusion. Only they should not be looked at too exclusively from the point of view of the " putrefactive theory," which Geissler has rightly chastised (*gegeisselt*). We should bear in mind, also, in forming our opinion, that the prevalence of the disease mostly goes with the cold season of the year ; and that is a circumstance which on the one hand sets the putrefactive theory in a still more ambiguous light, while on the other hand it raises the question whether it is not the changed mode of life following the arrival of the cold weather, and most of all the artificial heating and keeping warm of rooms,

the bad ventilation, and the saturation of the atmosphere with watery vapour, in short the production of what Krieger calls "an artificial climate"—whether it is not all these things, acting upon the organism and particularly upon the organism of the child, that go to make the real predisposing cause of the disease. Now, these are things which do not touch the proletariat merely, nor even pre-eminently, but concern the well-to-do classes just as much, if not even more.

But there is another, if subordinate, circumstance connected with the prevalence of the disease during the cold months, namely, the great multiplication of the points of contact, while that season lasts, between the more or less crowded inmates of the heated rooms, and the increased opportunities thereby offered for the transmission of the disease; and that is a circumstance, it is easy to see, which will tell much more among those of the population who are less well off than among those at the opposite pole of well-being, and will serve to explain without difficulty, in my opinion, the fact so often observed of diphtheria being prevalent among the proletariat.

§ 40. RECURS IN EPIDEMIC CYCLES. QUESTION OF AUTOCHTHONOUS ORIGIN. ANALOGOUS DISEASE IN FOWLS.

Diphtheria belongs to the same group as whooping-cough, scarlatina and other infective diseases, which almost always occur in *epidemics*. Isolated cases of true diphtheria happen rarely, and these mostly in the neighbourhood of places where the disease is epidemic, or as the forerunners of an epidemic coming on, or, lastly, as straggling cases after an epidemic is over. The history of the disease affords many examples of this. The history shows us, also, a peculiarity in the comportment of diphtheria as an epidemic, which distinguishes no other infective disease in so decided a manner—I mean the *cyclic character* of its epidemic or pandemic recurrences, a character which comes out very definitely in the historical sketch above given. The several cycles have extended over periods of various length, many of them only a few years and others lasting several decades.

Still more various has been the interval between the successive outbreaks of the disease; not unfrequently a period of tens of years has intervened, so that the malady on its re-appearance has surprised both the public and the profession as a new and unknown phenomenon. There have been great differences, also, in the areas covered by the disease from time to time. Sometimes it has been limited to a small region, occasionally even to a single place and its vicinity; in other cases the pestilence has extended over great tracts of country, whole States, or even divisions of the globe, making a true *pandemic*. It has been precisely under the latter circumstances that the malady has held its ground for so long a time—especially in the more populous centres—and has acquired the stamp of an *endemic*.

In view of these peculiar characteristics in the behaviour of diphtheria as an epidemic, the question forces itself upon the notice of the historian, whether the malady is established at a few points on the globe, whence it issues at longer or shorter intervals to attain a somewhat wide diffusion: whether, that is to say, diphtheria has certain *indigenous foci*, as cholera and yellow fever are certainly proved to have, whose bounds it breaks through from time to time under particular circumstances, to withdraw again to its native seats after a longer or shorter career outside them; or whether the disease each time that it appears is to be referred to an *autochthonous origin*, or, in other words, to the veritable development of the specific cause on which it depends. There is, for the present, no absolute solution to be given of this question, often discussed as it has been and answered by observers in various senses. In very many cases the outbreak of the disease in a certain locality can be shown to have been the consequence of its introduction from without; in many other cases the evidence of importation has not been forthcoming: which does not, indeed, absolutely tell against importation, for the reason that it is notoriously difficult to prove it even for diseases such as small-pox and cholera outside India, although there is no doubt that transmission is the only way in which they spread. From the point of view which the science of the moment assumes in looking at the nature of the specific cause of diphtheria, the theory of its

autochthonous origin would certainly seem to be untenable—unless we are to give up the principle of “*omne vivum ex vivo*” in so far as concerns the world of living things which are placed at the lowest step of the developmental ladder.

Analogous disease in fowls.—With reference to the origin of diphtheria, attention has lately been drawn to the occurrence of an epizootic diphtheritic affection, resembling or identical with angina maligna, in the mucous membrane of the mouth and throat of poultry (hens, ducks, geese, pigeons, &c.).¹ This disease causes a good deal of mortality, especially among the younger birds and the finer breeds; and it is unquestionably propagated by contagion, or, in other words, by direct transmission of the morbid poison from bird to bird. Experiments several times undertaken to produce the infection by inoculation of the products of disease, have afforded a positive conclusion in a few instances, but ambiguous or negative conclusions in others. Limmer² and Gerhardt³ publish cases, which they consider to prove the conveyance of the disease from fowls to men. It is very doubtful if this animal disease is altogether identical with the form of diphtheria that occurs in man; and still more questionable are the conclusions drawn by the two observers last mentioned. Mégnin states that he has opened the bodies of some 300 fowls dead of diphtheria over a period of three years, his workroom being in his own house; but that no case of angina maligna has occurred among the considerable number of children in the house, and that the fowls in question had been used as food without any harm coming to the persons who partook of them (a fact that had been already remarked upon by Friess).

¹ Nicati, ‘Compt. rend.,’ 1879, tom. 88, Nr. 6; Trasbot, ‘Gaz. méd. de Paris,’ 1879, p. 244; Mégnin, *ib.*, p. 253; Friedberger, ‘Zeitschr. für Tiermedizin und vergl. Pathol.,’ 1879, v, 161.

² ‘Bayer. med. Intelligenzbl.,’ 1881, No. 31, p. 333.

³ ‘Verhandl. des zweiten Congresses für innere Medicin,’ Wiesbaden, 1883.

§ 41. NATURE OF THE DIPHTHERITIC POISON. COMMUNICABILITY.

On no point in the natural history of diphtheria is there so complete agreement among observers, as on the *specifically infective* character of the disease and its *communicability*. The three points that are still matter of dispute at the present day are: (1) whether in true diphtheria we have to do with a lesion local in its origin and followed by general infection, or whether the general malady is primary and the local foci of disease secondary—a question that lies beyond the range of our inquiry; (2) of what nature the virus of the malady is; and (3) in what ways the virus spreads.

Although the numerous examinations of the diseased mucous membrane that have been undertaken by way of studying the nature of the *diphtheritic poison*, have hitherto afforded no certain conclusion;¹ we may infer *à priori* from the communicability of the disease, that is to say from the reproduction of the morbid cause underlying it, that *the virus is of an organic nature*. Again, it may be inferred from the manner in which the disease is transmitted, and from the fact of its diffusion being non-dependent upon meteorological influences, or upon influences of locality and sanitation (which are important in the etiology, as we have seen, only as making the predisposition in the individual or as adding to it), that the infection takes place directly from the sick person by the micro-organisms which represent the poison, or that it takes place indirectly, that is to say, by media which play the part simply of carriers; consequently that angina maligna counts among the exquisitely *contagious diseases*.

¹ A complete list of all the researches hitherto made to determine the specific virus of the disease, together with a criticism of the same, is given in Loeffler's paper in the 'Mittheilungen aus dem kaiserl. Gesundheitsamte,' Berl., 1884, ii, 421. Loeffler's own 'Researches on the Significance of Micro-organisms for the Production of Diphtheria,' carried out according to the method of Koch, have like the rest yielded nothing certain. As supplement to the list of writings put together by him I may mention the paper of Talamon, 'Progrès méd.,' 1881, p. 122, and Emmerich's research, 'Deutsche med. Wochenschr.,' 1884, No. 38, p. 614, published after the date of Loeffler's essay.

The spread of the disease to great distances through human intercourse is clearly proved by a great many indisputable facts: such as the observations lately made of its introduction into Algiers, Tunis, and Australia; its extensive diffusion from the eastern part of New York State to the most remote points of the same; and its spreading to Southern Russia from the Austrian division of the Bukowina. It is highly probable, however, that the poison clings not only to the sick, but also to articles with which they have come in contact—to their body-linen, bed-linen, and clothes. For example, it is Hensgen's¹ opinion that in the epidemic of diphtheria which came under his notice at Neustadt (Cleve-Berg) in 1875-76 (wherein at least a ninth part of the population were attacked), the spread of the malady was occasioned in no small degree by introducing the morbid poison with the woollen goods whose manufacture is one of the chief branches of industry there, the woollen material being in many cases given out from the factories to be worked in private houses. The virus would seem also to cling with great tenacity to the walls, woodwork, and furniture of rooms where cases of diphtheria had occurred, and to be so persistent that endemic foci of diphtheria have been created in this way within the limits of single rooms.

In all these cases the chief part is played undoubtedly by the atmosphere, in which the poison of the disease is suspended. The narrow limitation of many epidemics, often to a small village, or part of one, a single street, or cluster of houses, while the whole neighbourhood escapes, makes it hardly probable that the virus can be carried far by currents of air. As to the diffusion of the poison by solid or fluid articles of food (water, milk, &c.) acting as carriers of it, there have been no sufficiently noteworthy facts published as yet.

¹ 'Deutsche med. Wochenschr.,' 1876, No. 30 p. 356.

CHAPTER VI.

PNEUMONIA.

§ 42. RELATIVE FREQUENCY OF PNEUMONIA IN VARIOUS COUNTRIES.

Pneumonia takes high rank among the diseases that are found all over the globe; in that respect it is allied to catarrh of the bronchial mucous membrane, while it differs from the latter in that its distribution seems to be, on the whole, less dependent upon influences of climate, although it is no doubt commoner in some regions than in others. Unfortunately we have no sure measure of the number of cases in various parts of the world; the statistics of sickness derived from hospital reports are obviously without value for that purpose; and even the mortality returns afford no more than a very imperfect and hardly trustworthy conclusion, for the reason that the term "inflammation of the lungs" in the bills of mortality of different places comprehends sometimes more and sometimes less, so that the calculation of the number of cases based upon the ratio of the death-rate to the population does not yield us data that can very well be compared for the several localities. We may conclude, however, with some degree of certainty that the deaths from pneumonia in the colder and the temperate latitudes of Europe and North America average 1.5 per thousand of the population, the proportion sinking at some places to 1.10, and at others rising to 2.30.

I give the following death-rates from pneumonia as tolerably trustworthy; they are selected from a series which I have calculated for a large number of places.

Table of deaths annually from Pneumonia per 1000 inhabitants.

Place.	Period.	Number of years observed.	Death-rate per 1000 inhabitants.
Bergen ¹	1869-78	10	1'6
Christiania ¹	1869-78	10	1'3
Falun ²	1860-66	7	1'8
Copenhagen ³	—	17	1'7
London ⁴	1848-55	8	1'7
Hamburg ⁵	—	9	2'1
Berlin ⁶	1870-82	13	1'5
Bremen ⁷	1872-78	7	1'2
Halle ⁸	1843-52	10	2'3
Würzburg ⁹	1852-55	4	1'5
Frankfurt-o.-M. ¹⁰	1863-83	21	1'4
Stuttgart ¹¹	1873-82	10	1'9
Upper Engadine ¹²	1861-70	10	1'8
Geneva ¹³	1843-45	3	1'3
Brussels ¹⁴	1871-80	10	2'2
Paris ¹⁵	1839-50	12	2'5
Turin ¹⁶	1828-37	10	2'2
Turin ¹⁷	1869-78	10	2'4
Leghorn ¹⁷	1869-78	10	1'7
Boston, U.S. ¹⁸	1811-40	30	1'3
Boston, U.S. ¹⁹	1876-80	5	1'3
Cambridge, U.S. ¹⁹	1876-80	5	1'5
Lowell ¹⁹	1876-80	5	1'2
Lynn, U.S. ¹⁹	1876-80	5	1'4
Salem ¹⁹	1876-80	5	1'4
New York ²⁰	1805-37	33	1'6
Philadelphia ²¹	1807-40	34	1'1
Philadelphia ²¹	1855-64	10	1'2

¹ Holmsen, 'Norsk Mag. for Lægevidensk.', 1882, 410.² Hallin, 'Sv. Läkare Sällsk. Nya Handl.', ser. ii, Deel 2, 234.³ According to the information given in 'Bibl. for Læger und Sundhedscoll. Forhandl.'⁴ 'Eighteenth Annual Report of the Registrar-General,' Lond., 1857.⁵ Accounts in 'Hamb. Zeitschr. für Med.', Bd. 18, 21, 24, 27, 30, 33, 36, 39, 41.⁶ From the Reports of the Statistical Bureau and the Statistical Year-Book of the City of Berlin.⁷ Lorent, 'Jahresber. über den öffentl. Gesundheitszustand . . . in Bremen.'⁸ Baerensprung, 'Abhandl. der naturf. Gesells. in Halle,' Bd. i, Quart. 2, 1853.⁹ Virchow, 'Beitr. zur Statist. der Stadt Würzburg,' Würzb., 1859.¹⁰ 'Statist. Mittheil. über den Civilstand der Stadt Frankf.-a.-M.'¹¹ 'Med. Jahresb. über die Stadt Stuttgart vom Jahre 1883,' Stuttg., 1884.¹² Ludwig, 'Das Oberengadin in seinem Einflusse auf Gesundheit und Leben, Stuttg., 1877, 76.¹³ d'Espine, 'Annuaire de la mortalité Genevoise.'¹⁴ Janssens, 'Bull. de l'Acad. de méd. de Belgique.'¹⁵ Trébuchet, 'Annal. d'hyg.' ¹⁶ 'Informazioni statistiche,' pt. 2, 1847, 52.¹⁷ Sormani, 'Geografia nosologica dell' Italia,' Roma, 1881, 94.¹⁸ Shattuck, 'Amer. Journ. of Med. Sc.,' 1841, April, 369.¹⁹ 'Thirty-Ninth Report of Births, Marriages, and Deaths in the State of Massachusetts,' Bost., 1881, cxxvi.²⁰ Dannel, 'Amer. Journ. of Med. Sc.,' 1838, May, 237.²¹ Emerson, ib., 1827-1848; Jewell, ib.

In the more northern regions of Europe, such as *Iceland*,¹ the *Farøe Islands*, parts of *Sweden*² and *Norway* (particularly on the coast³), and at *St. Petersburg*,⁴ pneumonia occurs to a moderate extent, but not more frequently than in many other regions situated on the same meridians more to the south; while, on the other hand, we have information of the very common occurrence of the malady in many southern countries, including parts of *Italy* and the *Iberian Peninsula*,⁵ *Roumania*,⁶ *Turkey*,⁷ and *Greece*.⁸

Many of the earlier observers had remarked upon the large amount of pneumonia in various parts of Italy; thus Menis in his medico-topographical reports on Brescia,⁹ says: "La pleuro-peripneumonia tiene il primato fra la malattie endemiche infiammatorie;" and a similar opinion has been given by Hildenbrand for Pavia, Briard for Ancona, Carrière for Rome, and Mammi for Reggio. Sormani (l. c.) puts the death-rate from pneumonia as high as 2·8 per 1000 for Turin, 2·5 for Ferrara, 2·7 for Bologna, 2·9 for Genoa, and 4·1 for Rome; and he confirms the above opinions with special reference to the central and southern divisions of Italy as follows:¹⁰ "Quando si consideri il clima invernale della media e specialmente della bassa Italia, sembrerebbe che ivi le malattie di petto vi dovrebbero essere sconosciute o rarissime. Invece delle statistiche civili e militari esposte risulta, che queste malattie vi sono abbastanza frequenti." In Venice also, according to Taussig,¹¹ inflammation of the lungs is far from rare.

¹ Finsen, 'Jagttagelser angaaende Sygdomsforholdene i Island,' Kjöbenh. 1874, 82.

² Huss, 'Die Behandlung der Lungenentzündung,' From the Swedish. Leipz., 1861, 3.

³ Broch, 'Le royaume de Norvège,' Christ., 1876, p. 56. ⁴ Attenhofer, l. c.

⁵ Wallace, 'Edin. Med. and Surg. Journ.,' 1829, Jan., p. 76 (for Lisbon); Brandt, in 'Dobell's Reports,' 1870, i, 385 (for Portugal); Guthrie, 'Med. and Phys. Journ.,' lxiv, p. 187 (northern districts of Spain and Portugal); Hoffmann, 'Spec. geogr. med. de Europa australi,' Lugd. Batav., 1838, p. 22, and Faure, 'Souvenirs du Midi' (for Estremadura and New Castile in the central plateau of Spain); Martinez y Montes, 'Topogr. med. de la ciudad de Malaga,' Malaga, 1852, pp. 500, 503 (for Malaga).

⁶ Schmalz, 'Deutsche Klinik,' 1852, No. 39.

⁷ Sandwith, 'Assoc. Med. Journ.,' 1854, p. 434 (Northern Turkey); Rigler, 'Die Türkei und deren Bewohner,' ii, 224, and Beyran, 'Gaz. méd. de Paris,' 1854, p. 343 (Southern Turkey).

⁸ Valassopoulos, 'Congrès des médecins Grecs, 1882,' Constantinople, 1883, p. 17 (for Sparta).

⁹ 'Saggio di topogr. statist.-med. della provincia di Brescia,' Brescia, 1837, i, 127.

¹⁰ L. c., p. 288.

¹¹ 'Venedig von Seite seiner klimatischen Verhältnisse,' Venedig, 1847, p. 68.

From *Nearer Asia*, we have information of the common occurrence of pneumonia on the *Trojan plain*,¹ on the plateau of *Arabia*, and in the interior of *Syria*,² especially the mountainous districts, while the littoral of that country, including such places as *Beyrout*,³ would seem to be less subject to the disease. There are parts of *India* where pneumonia is found to be comparatively rare; such as the plain of Lower Bengal,⁴ *Madras*,⁵ the mountainous district of *Bellary*,⁶ the plateau of *Balgaum*,⁷ and the coast of *Cochin*,⁸ but the favorable opinion that used to be held of India in general in this respect, and is even entertained of it still, would appear to be by no means warranted. *Conwell*⁹ long ago wrote: "It is a generally received error that pulmonary disease in India is rare," and he included pneumonia in his remark. Bearing him out, we have recent accounts of the common occurrence of the malady in *Midnapore*¹⁰ (*Orissa*), the district of *Allahabad*¹¹ (province of *Agra*, in the upper basin of the *Ganges*), the hill-country of *Chota Nagpore*,¹² the mountainous districts of the *Deccan*,¹³ the *Himalayan slope*,¹⁴ *Sind* (northern India) and the adjoining territory of *Afghanistan*.¹⁵ In *Bombay*, also, pneumonia is not at all rare in an asthenic

¹ Virchow, 'Arch. für pathol. Anat.,' 1879, vol. 77, p. 174.

² Tobler, 'Beitr. zur med. Topogr. von Jerusalem,' Berl., 1855, p. 36; Robertson, 'Edin. Med. and Surg. Journ.,' 1843, April, p. 247; Guys, 'Statistique du Pachalik d'Alep,' Marseille, 1853, p. 62.

³ Post, 'New York Med. Rec.,' 1868, Jan., p. 149.

⁴ Hunter, 'Med. Gaz.,' 1847, i, p. 8; Gordon, 'Med. Times and Gaz.,' 1856, Aug., p. 188.

⁵ Geddes, 'Clinical Illustrations of the Diseases of India,' London, 1846, p. 285.

⁶ Henderson, 'Madras Quart. Journ.,' 1841, July, p. 328; Eyre, ib., 1860, Oct., p. 332.

⁷ Hunter, 'Trans. Bombay Med. Soc.,' ii, 1839, p. 32.

⁸ Day, 'Madras Quart. Journ.,' 1861, April, p. 320.

⁹ 'Observations chiefly on Pulmonary Diseases in India,' Malacca, 1829.

¹⁰ Green, in Webb's 'Pathologia Indica,' Lond., 1848, 106.

¹¹ Clegghorn, 'Med. and Sanitary Report of the Native Army of Bengal for the Year 1869,' Calcutta, 1870; Account in 'Madras Quart. Journ. of Med. Sc.,' 1871, Feb., 133.

¹² Dunbar, 'Ind. Journ. of Med. and Phys. Sc.,' New Ser., i, 443.

¹³ McKay, 'Madras Quart. Journ. of Med. Sc.,' 1861, July, 26.

¹⁴ Milroy, 'Transact. of the Epidemiol. Soc.,' 1866, ii, 150.

¹⁵ Hunter, 'Med. Gaz.,' l. c.; Don, 'Transact. of the Bombay Med. Soc.,' 1840, iii, 10; Costello, 'Lancet,' 1881, Jan., 171.

form, especially among the natives.¹ In view of these facts, and of the common occurrence of pneumonia in *Ceylon*,² particularly among the Malay population, the immunity enjoyed by English troops in *Burmah*³ is remarkable, as well as the rarity of the disease (attested by all observers) in *Cochin China*,⁴ the *Malay Archipelago*,⁵ and the south coast of *China*,⁶ including Canton⁷ and Amoy.⁸ On the east coast⁹ of *China* (e. g. *Shaughai*¹⁰) it is more common, as well as in *Japan*,¹¹ a hæmorrhagic variety running a chronic course being the type mostly met with.¹²

The frequency of pneumonia in *Australia* and among the islands of the *Pacific* was alleged by the earliest authorities; and their observations have been confirmed by the more recent accounts from Sydney¹³ and other places in New South Wales,¹⁴ from Victoria¹⁵ and from various other parts of the continent; as well as from Tasmania,¹⁶ Fiji,¹⁷ New Cale-

¹ Morehead, 'Clinical Researches on Disease in India,' Lond., 1856, ii, 304.

² Marshall, 'Notes on the Med. Topogr. of the Interior of Ceylon,' Lond., 1822.

³ Murchison, 'Edinb. Med. and Surg. Journ.,' 1855, April, 248; Dawson, 'Philadelphia Med. Examiner,' 1852, May.

⁴ Richaud, 'Arch. de méd. nav.,' 1864, Janv., 64; Thil, 'Quelques remarques sur les principales maladies de la Cochinchine,' Par., 1866, 35 (had not seen a single case of genuine pneumonia in three years); Bernard, 'De l'influence du climat de la Cochinchine, &c.,' Montp., 1867, 37; Morice, 'Arch. de méd. nav.,' 1875, Septbr., 225; Breton, 'Quelques considér. sur la guérison des plaies chez les Annamites,' Par., 1876, 10; Beaufils, 'Arch. de méd. nav.,' 1882, April, 262.

⁵ Heymann, 'Darstellung der Krankheiten in den Tropenländern,' Würzb., 1855, 158; van Leent, 1867, Sept., 171 (only 22 cases of pneumonia from 1861 to 1865 among 12,661 European troops in the Dutch East Indian Colonies); van der Burg, 'De Geneesheer in Nederlandsch Indie,' Batav., 1882, i, 81.

⁶ Hobson, 'Med. Times and Gaz.,' 1860, Nov., 478, Dec., 632.

⁷ Armand, 'Gaz. méd. de Paris,' Friedel, 'Beitr. zur Kenntniss des Klimas und der Krankheiten Ost-Asiens,' Berl., 1863, 126.

⁸ Dudgeon, 'Glasgow Med. Journ.,' 1877, July, 324.

⁹ Hobson, l. c.

¹⁰ Friedel, l. c., 87.

¹¹ Godet, 'Étude sur l'hygiène au Japon,' Par., 1880, 54.

¹² Wernich, 'Deutsche med. Wochenschr.,' 1878, Nr. 10, 111, and 'Geographisch-med. Studien, &c.,' Berlin, 1878, 174. But against that may be placed the statement of Schenbe ('Virchow's Archiv,' 1885, vol. 99, p. 376) that pneumonia is rare in Japan.

¹³ 'Voyage méd. autour du monde,' Par., 1829, 112.

¹⁴ Bourse, 'Arch. de méd. nav.,' 1876, Mars, 161.

¹⁵ Richardson, 'Edinb. Med. Journ.,' 1869, March, 802.

¹⁶ Dempster, 'Transact. of the Calcutta Med. Soc.,' 1835, vii, 357.

¹⁷ Messer, ib., 1876, Nov., 321.

donia,¹ Tahiti,² the Gambier Group³ (Mangareva), and the Marquesas.⁴

On the continent of Africa, *Lower Egypt*⁵ and *Tunis*,⁶ so far as is known, enjoy a remarkable exemption from pneumonia. On the other hand, the negroes in the upper basin of the Nile are greatly subject to it. Especially dreaded are the pneumonias of the desert and steppes, which break out among the Bedouins after fatiguing marches; under the same circumstances, the malady has also been epidemic among the native troops in the *Soudan*.⁷ There are many cases (in fact as many as in European countries, although not so much among the European residents as among the natives and the acclimatised Europeans), on the *Zanzibar coast*⁸ (principally among the higher-class), in *Mozambique*,⁹ *Madagascar*,¹⁰ *Nossi-Bé*,¹¹ and the *Comoro Islands*¹² (Mayotte); as well as at the *Cape*.¹³ Also, we are told by various writers that pneumonia is common (again mostly among the natives) at nearly every part of the *West Coast of Africa* and in the islands adjoining; such as the coast of *Benguela*,¹⁴ the *Gaboon*,¹⁵ *Fernando Po*,¹⁶ the *Bight of Benin* and *Biafra*.¹⁷

¹ Charlopin, 'Notes rec. en Calédonie de 1863 à 1867,' Montp., 1868, 19.

² Ref. in 'Arch. de méd. nav.,' 1865, Oct., 288; Brunet, 'La race Polynésienne, &c.,' Par., 1876, 25.

³ Lesson, 'Voyage aux îles Mangareva,' Rochefort, 1845.

⁴ Ref. in 'Arch. de méd. nav.,' 1865, Oct., 297.

⁵ Pruner, 'Die Krankheiten des Orients,' Erlang., 1847, 283; Griesinger, 'Arch. für physiol. Heilkde.,' 1853, xii, 549; Pissas, 'Congrès des méd. Grecs 1882,' Constant., 1883, 17.

⁶ Ferrini, 'Saggio sul clima e sulle precipue malattie della città di Tunisi, &c.,' Milano, 1860, 177; Friocourt, 'Arch. de méd. nav., 1884, Juill. 17.

⁷ Hartmann, 'Naturgesch.-med. Skizzen der Nilländer,' Berlin, 1865.

⁸ Burton, 'Zanzibar, its City, &c.,' Lond., 1874.

⁹ Roquete in 'Arch. gén. de méd.,' 1868, Mars, 161.

¹⁰ Borchgrevink, 'Norsk Mag. for Laegevidensk.,' 1872, 234.

¹¹ Guyot, 'Arch. de méd. nav.,' 1882, Nov., 329; Deblenne, 'Essai de géogr. méd. de l'île Nossi-Bé,' Par., 1883, 160, 221.

¹² Grenet, 'Souvenirs méd. de quatre années à Mayotte,' Montp., 1866.

¹³ Scherzer, 'Zeitsch. der Wien. Aerzte,' 1858, 152; Fritsch, 'Arch. für Anat. und Physiol.,' 1867, 733; Egan, 'Med. Times and Gaz.,' 1877, 4, Aug., 112.

¹⁴ Ritchie, 'Edinb. Monthly Journ. of Med. Sc.,' 1852, May, 405; Moreira, 'Jorn das. sc. med. de Lisboa,' xv, 121.

¹⁵ Bestion, 'Arch. de méd. nav.,' 1881, Nov., 378; Abelin, 'Étude sur le Gabon,' Par., 1872, 31.

¹⁶ Quétan, 'Arch. de méd. nav.,' 1868, Janv., 71.

¹⁷ Daniell, 'Sketch of the Med. Topogr. of the Gulf of Guinea,' Lond., 1849, 53, 94.

coasts, *Sierra Leone*,¹ *Senegambia*² (particularly Upper Senegambia and the adjoining regions of the *Greater Soudan*³), the *Cape Verde Islands*,⁴ the *Canaries*⁵ and *Madeira*.⁶ In *Algiers*,⁷ both on the coast and in the interior, pneumonia is not at all rare; it is only the natives in Kabylia that would seem to have some degree of immunity from it.⁸

In the inhabited countries of the Western Hemisphere farthest north, including *Greenland*,⁹ *Newfoundland*,¹⁰ *Nova Scotia*, *New Brunswick* and *Canada*, pneumonia counts among the commonest of acute inflammatory affections; and as we shall see, that part of the world is of particular interest for epidemic outbreaks of pneumonia, which have been exceedingly frequent and very widely spread. In the *United States*, the number of cases observed is on the whole proportionate to what we find in Europe;¹¹ and, just as in the old country, there are some regions distinguished from others by their comparative freedom from pneumonia.

¹ Boyle, 'Med.-Chir. Account of the Western Coast of Africa,' Lond., 1831, 396.

² Thevenot, 'Traité des malad. des Européens dans les pays chauds, &c.,' Par., 1840, 248; Berville, 'Remarques sur les malad. du Sénégal,' Par., 1857; Thaly, 'Arch. de méd. nav.,' 1867, Sept., 175; Borius, ib., 1882, Avril, 312; Berger, 'Considér. hyg. sur le bataillon de tirailleurs Sénégalais (1862—1865),' Montp., 1868, 48; Hebert, 'Une année méd. à Dagana,' Par., 1880, 22.

³ Quintin, 'Extrait d'un voyage dans le Soudan,' Par., 1869, 37; Ballay, 'L'Ogooué, Afrique équator. occidentale,' Par., 1880, 34 (refers to the rarity of pneumonia among persons of the white race).

⁴ Hopffer, 'Arch. de méd. nav.,' 1877, Mars, p. 179.

⁵ Ref., ib., 1867, April, p. 252.

⁶ Kämpfer, 'Hamb. Zeitschr. für Med.,' xxxiv, 156.

⁷ Deleau, 'Mém. de méd. milit.,' 1842, lii, 230 (for Constantine); Villette, ib., 1842, liii, 51 (for the plain of Metidja); Finot, ib., 1844, lvi, 1 (for Blidah, where the natives suffer much more than the Europeans); Cambay, ib., 1844, lvii, 1 (for Tlemcen, where there were 62 cases of pneumonia and pleurisy among 4500 European troops in 1842 and 1843); Haspel, 'Malad. de l'Algérie,' Paris, 1852, ii, 418; Catteloup, 'De la pneumonie d'Afrique,' Paris, 1853 (for the elevated parts of Algiers); Bertherand, 'Méd. et hyg. des Arabes,' Paris, 1855.

⁸ Bazille, 'Gaz. méd. de l'Algérie,' 1868, p. 41; Claudot, 'Mém. de méd. milit.,' 1877, Mars (both relating to Fort Napoleon).

⁹ Lange, 'Bemaerk. om Grönlands Sygdomsforhold.,' Kjöbenhavn, 1864, p. 22; Smith, 'Edin. Med. Journ.,' 1868, March, p. 258.

¹⁰ See the figures in the 'Army Med. Reports' for the respective British colonies.

¹¹ See the death-rates from pneumonia in several cities of the United States given in the list on p. 117.

Drake,¹ supported by the statistics of sickness in the army, is of opinion that pneumonia is less commonly met with in the Northern than in the Southern States, in the proportion of 50 to 73; but I cannot suppose that these statistics afford us results trustworthy enough to decide the matter. At the same time, the figures are in part borne out by the writings of medical authorities in the Southern States;² and it would appear that the preponderance of pneumonia there depends not a little on the large number of cases among the negroes, a fact to which attention was called at an early period by Tidyman,³ and after him by Bayley and others.

Among the regions of the United States least subject to pneumonia we have to reckon the more elevated prairies in the States of *Illinois*, *Missouri*, *Wisconsin* and *Iowa*,⁴ the east coast of *Florida*, several points on the plateau of *Utah*⁵ and *Washington Territory*,⁶ and more especially the littoral of *California*,⁷ with the valley of the Sacramento.⁸

In *Mexico* the high table-land ("tierra fria") is the principal region of pneumonia; on the coast-belt (Vera Cruz, Tabasco, Yucatan), the malady is much less common, and is indeed mostly seen among the negroes and those of mixed race.⁹ From *Central America* we learn that it is compara-

¹ 'Treatise on the Principal Diseases of the Interior Valley of North America,' Philad., 1854, ii, 852.

² Posey, 'Trans. Amer. Med. Assoc.,' 1857, x (Georgia); Heustis, 'Amer. Journ. of Med. Sc.,' 1831, May, p. 94 (Central Alabama); Bailey, 'Phil. Med. and Surg. Rep.,' 1871, June, p. 453 (Eastern Tennessee); Wright, 'Amer. Med. Intelligencer,' 1841, Dec., and an account in 'Proc. Arkansas State Med. Soc.,' 1873 (Arkansas); Stark, 'Edin. Med. and Surg. Journ.,' 1851, Jan., p. 140 (Philadelphia); Kilpatrick in Fenner's 'Southern Med. Rep.,' New Orleans, 1851, ii, 157 (Trinity, Louisiana).

³ 'Philad. Journ. of Med. and Phys. Sc.,' 1826, new ser., iii, 328.

⁴ Bradford, 'Notes on the North-West, or Valley of the Upper Mississippi,' New York, 1846; Foot, in 'Statist. Rep. of the U.S. Army,' 1856, p. 47 (for Fort Winnebago, Wisc.); Keeny, ib., p. 50 (for Fort Dodge, Iowa).

⁵ Bartholow, 'Amer. Journ. of Med. Sc.,' 1860, April, 323 (Fort Bridger).

⁶ Haden, 'Statist. Report,' 1856, 478 (Fort Steilacoom).

⁷ Praslow, 'Der Staat Californien in med.-geogr. Hinsicht.,' Gött., 1857, 36 (saw only a few cases of pneumonia in San Francisco from 1849 to 1856).

⁸ Blake, 'Amer. Journ. of Med. Sc.,' 1852, July, 53; Stillman, 'Edin. Med. and Surg. Journ.,' 1852, Oct., 286.

⁹ Heinemann, in 'Virchow's Arch.,' 1867, xxxix, 607, 1873, lviii, 179; Jourdanet, 'La Mexique, &c.,' Par., 1864, 262; Vaillant, 'Notes méd. rec. à l'hôpital de la marine de Vera-Cruz 1864-1865,' Par., 1869, 29.

tively rare in *Nicaragua*¹ and *Costa Rica*;² whereas it is often met with over whole extent of the State of *Panama*.³ There are the same differences, according to the authorities, among the various *West Indian Islands*, differences which would seem to depend essentially on the situation of the islands, or the exposure of their shores to the prevailing winds: that is to say, whether they are to windward or leeward.⁴ Here again the negro race furnishes the largest contingent of the sick.⁵ The islands given as most subject to pneumonia are *Cuba*,⁶ *St. Domingo*,⁷ *St. Thomas*,⁸ and *Trinidad*,⁹ those most exempt are said to be *Martinique*,¹⁰ *Guadeloupe*¹¹ and *Barbadoes*.¹² From *Cayenne* all authorities¹³ report the frequency of pneumonia, particularly among the natives, negroes and creoles; so also for *Brazil*,¹⁴ equally the coast and the interior; for *Paraguay*,¹⁵ and the States of the *Argentine Republic*;¹⁶ and for the littoral and the tablelands of *Chili*,¹⁷ *Peru*¹⁸ and *Bolivia*.¹⁹

¹ Bernhard, 'Deutsche Klinik,' 1854, Nr. 8.

² Schwalbe, 'Arch. für klin. Med.,' 1875, xv, 336.

³ Wagner, 'Beitr. zur Meteorologie und Klimatologie von Mittel-Amerika,' Dresden, 1864, 23.

⁴ Chisholm, 'Manual of the Climate and Diseases of Tropical Countries,' Lond., 1822, 104.

⁵ Desportes, 'Hist. des malad. de St. Domingue,' Par., 1770, ii, 134; Moulin, 'Introd. à la pathol. de la race Nègre dans les pays chauds,' Par., 1866.

⁶ Olliver, 'Bull. des sc. méd.,' xx, 415; Morelet, 'Voyage dans l'Amérique centrale, &c.,' Par., 1857, ii, 660.

⁷ Desportes, l. c.

⁸ Barclay, 'Bibl. for Laeger,' 1830, i, 101.

⁹ McCabe, 'Edinb. Med. and Surg. Journ.,' 1818, Nov., 596.

¹⁰ Ruz, 'Arch. de méd. nav.,' 1869, Oct., 264.

¹¹ Carpentier, 'Étude hyg. et méd. du Camp-Jacob (Guadeloupe),' Par., 1873, 38.

¹² Jackson, 'Bost. Med. and Surg. Journ.,' 1867, July, 447.

¹³ Bajon, 'Nachrichten zur Gesch. von Cayenne.' From the French. Erfurt, 1780, ii, 60; Campet, 'Traité des malad. graves des pays chauds,' Par., 1802, 210; Segond, 'Revue méd.,' 1836, Novbr.; Laure, 'Considér. prat. sur les maladies de la Guayane, &c.,' Par., 1859, 46.

¹⁴ Sigaud, 'Du climat et des malad. du Brésil,' Par., 1844, 112, 301; Rendo, 'Études topogr. . . sur le Brésil,' Par., 1848, 67; Mantegazza, 'Lettere med. sulla America meridionale,' Milano, 1863, ii, 214.

¹⁵ Masterman in 'Dobell's Reports,' 1870, i, 382.

¹⁶ Brunel, 'Observ. topogr. et méd. faites dans le Rio de la Plata, &c.,' Par., 1842, 36; Féris, 'Arch. de méd. nav.,' 1870, Oct., 254.

¹⁷ Lafargue, 'Bull. de l'Acad. de méd. de Paris,' xvii, 189; Ref. in 'Arch. de méd. nav.,' 1864, Août, 103; Schneider, 'Berl. klin. Wochenschr.,' 1877, No. 4.

¹⁸ Smith, 'Edinb. Med. and Surg. Journ.,' 1840, July, 1, 1842, Apr., 361.

§ 43. EPIDEMICS OF PNEUMONIA.

The occurrence of pneumonia in *epidemic diffusion* is an interesting point in its natural history. Notwithstanding my detailed handling of the matter in the first edition of this work (vol. ii, 1862-64),¹ it is only of recent years that the subject has received any considerable degree of attention; and even now it is discussed for the most part without regard to the past and with a one-sided preference for contemporary observations. I have judged it incumbent on me, therefore, to go through the whole of the published facts once more, so as to sketch the history of the epidemics of pneumonia as comprehensively as may be.

Sixteenth century.—The first information on the epidemic prevalence of inflammation of the lungs is met with in the sixteenth-century chronicles of pestilence in Italy,² Germany, the Netherlands, Switzerland and France. On Italian soil epidemics of that sort were seen at Venice³ in the autumn and winter of 1535, at Brescia and other places in Lombardy⁴ in 1537, in the winter and spring of 1563-64 over a great part of the peninsula ("per totam fere Italiam"),⁵ in the spring of 1568 in a few valleys of the Apennine,⁶ in 1586 at Bassano,⁷ and in 1597 at Genoa and several other places on the Riviera.⁸ In Switzerland, where the severe forms of

¹ The first account of the history of epidemics of pneumonia was published by me in the 'Prager Vierteljahrschr. für Heilkunde,' 1853, iv, 101.

² Indications of the epidemic prevalence of malignant pneumonias in Italy may be found before that in certain medical writers of the middle ages, such as Valescus de Tharanta, 'Philon.,' lib. iii, cap. 8, Lugd., 1538, p. 149 b; Guaineri, 'Comment. de pleuresia,' Op. Venet., 1517, p. 31 a; and particularly Savonarola, 'Practica,' Tr. vi, cap. 10, rubr. 13, Venet., 1497, p. 123 b, where it is stated: "In civitate nostra Padue et Trevisii et Venetiæ 1440 de mense Martii antea et post apparuit pleuresis mala, quæ erat contagiosa, ex qua multi et plurimi moriebantur."

³ Massa. An alphabetical list of all the authorities here quoted on epidemic pneumonia, with the bibliographical references, is given at the end of this chapter.

⁴ Mundella. ⁵ Coiter. ⁶ Cardano. ⁷ Prosper Alpino. ⁸ Paschetti.

Tschudi, 'Oesterr. med. Wochenschr.,' 1846, 445, 660; ref. in 'Arch. de méd. nav.,' 1864, Sept., 188; Mantegazza, l. c.

¹⁰ Id.

pneumonia are known under the names of "Stich" (stitch) "Alpenstich," "malignant stitch," or "putrid stitch," cases occurred almost every year at the melting of the snows and particularly when the damp winds (*Föhne*) were blowing strong; these cases were sometimes sporadic, and at other times in small epidemics.¹ They were found mostly in the valleys of the High Alps, such as the Reussthal on the southern side of the Lake of Lucerne, the Halsithal and Gadmerthal in the Bernese Oberland, and in those of Glarus and the Grisons. For the period in question we have epidemiographical data relating to the disease in the Grisons in 1550,² and in Zurich, Basel and the Grisons in the winter and spring of 1563-64.³

In 1564 the disease would appear to have attained a wide diffusion over the larger part of Western Europe, including not only many parts of Italy, as already mentioned, but also German territory in the lower valley of the Rhine,⁴ and the Netherlands,⁵ the city of Antwerp in particular.⁶ The sickness reappeared as an epidemic in Germany in the spring of 1576, again in the lower basin of the Rhine,⁷ and in the spring of 1585 at Ingolstadt and in the vicinity.⁸ From France we hear of epidemic pneumonia at Paris⁹ in the spring of the years 1571 and 1574, and of a very malignant epidemic in Provence in 1598.¹⁰

Type of the epidemic disease.—The descriptions given by medical writers of the type of disease in these epidemics correspond to that kind of pneumonia which is called "typhous" or asthenic. The attack began with a more or less severe rigor, acute pains in the head and chest, and a cough which was at first dry, but afterwards attended with expectoration; on the third day the sputa were tinged with blood, and the patient began to be delirious or to fall into a stupor; loose evacuations followed, and when the issue was unfavorable death happened on the sixth or seventh day, or even earlier. If the disease were protracted over the ninth day, the prognosis was good, although even

¹ See Christian, Guggenbühl, S. 2, and Klebs, 'Archiv für experimentelle Pathologie,' 1875, iv, 420.

² Guggenbühl, S. 4.

³ Duns, Gessner, pp. 17, 19, 21, 33, 37, 39. See also Guggenbühl, S. 6, 103, 105, and Meyer-Ahrens.

⁴ Wier.

⁵ Gemma, 'De divinis naturæ characterismis,' Antwerp, 1575.

⁶ Dodonaus. ⁷ Wier. ⁸ Oethaeus. ⁹ Paillou. ¹⁰ Fontanus.

in these cases there were sometimes fatal relapses. In all epidemics the mortality was very high; "contagiosum quoque esse," says Dunus, "inde liquido constabat, quod multi in eadem familia corriperentur." The anatomical examination, according to Massa, showed "apostemata pleuritica." Coiter says of it: "inveni, in omnibus quos secui, quasi totos pulmones sanguine media ex parte putrido repletos, turgidos, atque mirum in modum induratos;" while Dodonaeus writes: "pulmones horum vel purulenti fuere, vel abscessum habuere."

Seventeenth century.—For the seventeenth century there are accounts of epidemics of pneumonia in Germany, Switzerland, and Italy. In Germany, the malady was prevalent, particularly among children, during very severe weather in the spring of 1624 at Augsburg;¹ and it was observed in the spring of 1689 among the French troops occupying Philippsburg, and at other places in the Breisgau.² In Switzerland, epidemics of the "Alpenstich" were observed in 1652, and again in 1695 in the Glarus, and in the spring of 1685 at Lutry and various other places on the northern shore of the Lake of Geneva.³ In several parts of Italy, a very severe epidemic of malignant pneumonia prevailed in the winter and spring of 1601-2,—in the plain of Pesaro, and the hilly districts of Urbino,⁴ at Imola in the Æmilia,⁵ and at Verona;⁶ in 1610 the disease appeared at Guastalla in the Æmilia,⁷ and at Mantua and other places in Lombardy; in the winter of 1612 at Gualdo in the Marches;⁸ in the spring of 1633 widely diffused over the Romagna and adjoining provinces;⁹ in the spring of 1696 at Ferrara;¹⁰ and in the winter of 1698 at Padua.¹¹

All these epidemics, like the former, had a pronounced typhoid or asthenic character. It is a noteworthy fact, that, like the epidemics of 1564 before mentioned in the lower basin of the Rhine and in Switzerland, those in Urbino, Verona, Guastalla and the Romagna, had pneumonia remarkably often complicated with diphtheria. Opinions were divided as to the contagiousness of the malady. While Ravicio pronounced decidedly for an "influsso epidemico maligno con qualche immediato contagio," adducing as particular evidence of transmission the fact that as soon as one

¹ Hoechstetter.² Brunner, Vorster.³ Guggenbühl, pp. 14, 15.⁴ Colle.⁵ Codronchi.⁶ Chiocot.⁷ Ravicio.⁸ Tosi.⁹ Baronio.¹⁰ Lanzoni.¹¹ Castelli.

case occurred in a house, two, three or four more followed it; on the other hand Colle, Chiocco and Baronio denied its contagiousness. The anatomical examination showed, according to Colle, that "præcordium copiosa aqua foetente intumescibat, apostemaeque aderat in pulmone pituitosum, substantiaque pulmonis tota magnitudine sanguine et pure vagante;" Tosi found in one case "pulmones nigricantes et veluti combusti absque ulla sanie;" Baronio speaks of having found in the cadaver serous effusions into the pleura, the lungs of a livid colour and filled with tenacious bloody mucus. In the epidemic at Philippsburg Brunner found in persons dead of the sickness, blood-stained effusions into the pleura and pericardium, and the lungs in part condensed (hepatised), and in part broken up or rendered diffuent by suppuration and (perhaps) gangrene.

Eighteenth century.—The epidemiology of the eighteenth century is unusually rich in accounts of epidemics of pneumonia, particularly in Italy, Switzerland and France; and the earliest records of malignant epidemical inflammation of the lungs in Spain, England, Denmark and North America belong to the same period.

In Spain the malady was first seen in 1734 in the town of Verga (Catalonia); and it was very widely diffused through the Asturias in the autumn and winter of 1735-36, and in Valencia in 1736-38.¹ Several years before that (winter of 1730), it had been very malignant in Minorca,² the patients dying either in a "crazed" state, or "suffocated by want of breath." From Italy there are records of its epidemic prevalence in the winter of 1705 at and around Castel Farnese (territory of Viterbo³), in the spring of 1706 at Bologna,⁴ spring of 1709 and of 1713 at Turin and other places in Northern Italy,⁵ winter and spring of 1714 and of 1720 at Rome,⁶ spring of 1721 at Turin and in several villages on the slopes of the Apennine,⁷ winter of 1754 at Padua,⁸ winter of 1761 in many parts of Italy,⁹ spring of 1767 in the valley of the Tanaro (Piedmont),¹⁰ winter and spring of 1775 at San Miniato, Empoli, Pistoja and other places in Tus-

¹ Villalba, ii, 194-197.

² Font.

³ Pedratti.

⁴ Morgagni, 204. ⁵ Guidetti, 64, 76.

⁶ Gagliardi.

⁷ Bianchi, Richa.

⁸ Morgagni, vii, art. 11.

⁹ Targioni Tozzetti. ¹⁰ Jemma.

cany,¹ winter of 1779 in many Italian localities (including Pavia,² Bergamo,³ Correggio,⁴ Siena,⁵ Florence,⁶ Umbria⁷ and Rome⁸), spring of 1780 at Leghorn,⁹ at Pistoja again, vicinity of Florence and elsewhere in Tuscany,¹⁰ and at Como,¹¹ winter of 1787 and of 1795 at Padua,¹² winter of 1793-94 at Pavia,¹³ and in the winter and spring of 1796 in Turin and vicinity.¹⁴

In the records of nearly all these epidemics, attention is drawn to the malignant type of the disease and its so-called typhoid symptoms; while the condensation (hepatisation) of the pulmonary tissue or the sanious liquefaction of it are given as the characteristic anatomical feature.

Thus Morgagni says (loc. cit., p. 204): "*Pulmones compactam, ut in hepate est, substantiam habebant;*" Gagliardi, who had opened some thirty cadavers, says (loc. cit., p. 9): "*In due modi s'insinuava nella sostanza de' polmoni il vizio morbososo, cioè, o per mortificaria a segno, che in breve, mediante la formata gangrena, o sfacelo inducesse la morte, o pure con produrvi una tal concrezione parenchimatosa, li faceva divenire a guisa appunta di fegato, a segno, che si poteva con ogni ragione chiamare, o gangrenoso, o flemmonoso il vizio, che ivi s'induceva.*" Pirri found "*i polmoni degenerati in una sostanza epatica per la sua durezza.*" Kreyssig, who saw the disease in the clinic of Peter Frank, mentions only one fatal case, where exudation was found in the pleura, the left lung much congested, infiltrated but still soft, and the right lung very voluminous and firm, "*hepatis cocti substantiam aemulans.*"

From Switzerland we have information of epidemics of "*Alpenstich*" for the year 1709 in the mountainous parts of the canton of Bern,¹⁵ 1719 at Buchs (Unterwalden),¹⁶ 1754 at Basel,¹⁷ 1757 among the Bernese valleys,¹⁸ 1762 at many places in the cantons Vaud and Bern,¹⁹ 1764 at a very large number of places in Switzerland (in Bern, Uri, Solothurn, Vaud, &c.,)²⁰ 1768 at a few villages in the canton of Zurich,²¹

¹ Marzi, Pucci, Bottoni.

² Galli.

³ Vitali.

⁴ Baraldi.

⁵ Bottoni.

⁶ Gianotti.

⁷ Cestari.

⁸ Pirri, Orlandi.

⁹ Desbouts.

¹⁰ Torrigiani.

¹¹ Della Porta.

¹² Penada, Quinq. i, ii.

¹³ Kreyssig.

¹⁴ Buscaglione.

¹⁵ Christian.

¹⁶ Account in the '*Breslauer Samml.*' 1719, März, 297.

¹⁷ Zwinger.

¹⁸ See Guggenbühl, S. 15.

¹⁹ Haller.

²⁰ d'Apples, Tissot. ²¹ Aepli.

1771 in Glarus,¹ and 1783 again in the cantons Vaud and Bern.² The season of all these epidemics was winter and spring, and in every instance the disease ran its course with the typhoid symptoms already spoken of, or sometimes in the form of so-called "bilious pneumonia."

In France during the eighteenth century, and, so far as we may conclude from the data, chiefly during the latter half of it, pneumonia was prevalent in truly pandemic diffusion. Here again all the epidemics occurred in winter or spring, with the single exception of the outbreak in Belle-Isle-en-mer in the summer of 1755; in almost all of them it assumed a severe and more or less malignant (typhoid) type; and the abundant anatomical inspections revealed everywhere the same state of matters—exudations into the pleura, pleuritic adhesions, the lungs in a condition of typical hepatisation, or of soft, hæmorrhagic infiltration, and the bronchial mucosa congested, or here and there sodden.³

The earliest of this series of French epidemics occurred in 1708 and 1709 at Paris⁴ and at Pujol in Languedoc;⁵ then follow other epidemics at Paris⁶ in 1716, 1728 and 1731, at Rouen⁷ in 1737, in the vicinity of Pavilly (Normandy)⁸ in 1739, at Lembesc (Provence)⁹ in 1741, at Aigues-Mortes (Languedoc)¹⁰ in 1745, and at other places in the same province¹¹ in 1748.

From 1751 onwards the epidemiographical notices of pneumonia grow apace. In that year itself, it was prevalent in Roquebrune (near Nice), while the adjoining villages of Frejus and Pujet escaped,¹² and in the same year at Nerac in Guyenne;¹³ 1753 at Montpellier;¹⁴ 1754 in Paris;¹⁵ 1755 at Lens, Douay, Arras and other places in the county of Artois,¹⁶ as well as at Bourbon-Lancy in Burgundy¹⁷ and in Belle-Isle-en-mer (Brittany);¹⁸ next year in and around

¹ See Guggenbühl, 36.

² Chatelanat, Guggenbühl, 45, 119.

³ See especially the accounts by Rochard, Marchand, Deplaigne, Sumeire, and Sauvages, l. c., § 2.

⁴ Ref. in 'Journ. de méd.,' 1763, Janv., xviii, 177.

⁵ Deidier.

⁶ Ref., l. c., Septbr., xix, 270, 1764, Mai, xx, 459, und Juill., xxi, 68.

⁷ Le Cat.

⁸ Lepecq, 'Topogr.,' 137.

⁹ Roustan.

¹⁰ Sauvages.

¹¹ Bouillet.

¹² Darluc.

¹³ Roulin.

¹⁴ Sauvages.

¹⁵ Malouin.

¹⁶ Ref. in 'Journ. de méd.,' 1755, Août, 117.

¹⁷ Pinot.

¹⁸ Rochard.

Aumale (Normandy),¹ 1757 at several places in the vicinity of Paris,² at St. Jean-d'Angeli (St. Onge),³ Valenciennes (Flanders),⁴ Toulon and vicinity,⁵ and Capistan (Languedoc),⁶ 1758 in and around Lambesc (second time),⁷ at Marignan⁸ and Tarascon⁹ (both in Provence), at Valence (Dauphiné)¹⁰ and at Lille.¹¹ After this come the records of a number of more isolated outbreaks: 1765 at Castelsarrasin (Guyenne),¹² 1767 at Montélimar (Dauphiné),¹³ 1768 in lower Languedoc (particularly among certain villages along the Rhone),¹⁴ 1772 in a village near Verdun,¹⁵ in the vicinity of Tournay (Bigorre),¹⁶ at Rouen¹⁷ and at Castel-Jaloux near Bazas (Guyenne),¹⁸ 1777 at Cherbourg,¹⁹ and at a village near Bernay (Normandy),²⁰ and in 1779 at Longon in Guyenne.²¹ In the winter and spring of 1783, 1784 and 1785 the disease again became widely prevalent both in the north and south of France,²² as at Autun,²³ Tronget,²⁴ vicinity of Auxonne,²⁵ and at other places in Burgundy; also at Beauvais (Ile-de-France)²⁶ and Vitry-le-Français (Champagne).²⁷ Finally, to come to the end of the eighteenth century, we have records of pneumonia having been epidemic in the winter of 1788 at Noyon (Ile-de-France),²⁸ and at Poitiers both in that and the following year.²⁹

For Great Britain during the same period we have accounts of the epidemic prevalence of severe forms of pneumonia in Fife³⁰ in the winter of 1736, and at Plymouth³¹ in the winter and spring of 1740 and of 1746. In Germany it was prevalent in the spring of 1734 at Frankfurt-on-the-Oder,³² 1765 in Clausthal,³³ 1767 (winter and spring) in a very malignant form at Eisenach,³⁴ 1770 (spring) in the parish of Grohnde near Hameln,³⁵ and in 1773 at Vienna.³⁶

¹ Marteau.² Ref., l. c., 1757, Juill., vii, 79.³ Marchant.⁴ Deplaigne.⁵ Berthonie.⁶ Bouillet.⁷ Roustan.⁸ Sumeire.⁹ Moublot.¹⁰ Gignoux.¹¹ Boucher.¹² Sauvages, § 2.¹³ Menuret.¹⁴ de la Brussee.¹⁵ Guyton, ad ann. 1772.¹⁶ Planchon.¹⁷ Lepecq, 'Observ.', Germ. ed., 417.¹⁸ Richard.¹⁹ Lepecq, 'Topogr.', p. 486.²⁰ Id., p. 257.²¹ Graulau.²² Caille.²³ Guyton, ad ann. 1788.²⁴ Desgranges.²⁵ Roussel, Girault.²⁶ Hatté.²⁷ Moreau.²⁸ Dufour.²⁹ Lamarque.³⁰ Account in 'Edin. Med. Essays and Observ.', v, p. 35.³¹ Huxham.³² v. Bergen.³³ Lentin.³⁴ Grimm.³⁵ Glave.³⁶ Quarin.

From Denmark one epidemic of the kind is reported—on board the fleet before Copenhagen in the spring and summer of 1779.¹

Epidemics in the United States.—The earliest accounts of severe epidemics of pneumonia in the North American Colonies date from the eighteenth century: such as those of 1712, 1719, 1760-61, and 1795-96 at Waterbury, Hartford and other places in Connecticut;² winter of 1734-35 in Virginia;³ 1749 at several places in Long Island;⁴ and at Philadelphia⁵ in 1791 and 1792. These outbreaks, taken along with other scattered outbreaks during the first ten years of the present century (1807 in Connecticut, 1809 (winter and spring) along the coast of North Carolina,⁶ in the parish of St. John, South Carolina,⁷ and in certain southern counties of Georgia,⁸ and in Vermont State⁹ during the winter of 1810-11), form the precursors of a pandemic of pneumonia which extended during the years from 1812 to 1825 over a great part of the continent of North America from Canada to the Gulf of Mexico, although, as in France the century before, its epidemic character did not come out except in winter and spring for all the years that it lasted.¹⁰

The starting-point of the pandemic was Canada,¹¹ where it began in the winter of 1812. Shortly after, the disease showed itself in New York State; it reached a wider diffusion there in the winter and spring of the three years from 1813 to 1815, the notices of it referring more particularly to the counties of Dutchess,¹² East Chester and West Chester,¹³ Albany,¹⁴ Saratoga¹⁵ and Washington (town of Granville),¹⁶ as well as to New York City¹⁷ and to Long Island.¹⁸ At the same time as it appeared in New York, it showed itself in a number of towns and parishes in Maine,¹⁹ at New Milford and other places in Connecticut,²⁰ in Vermont,²¹ and a little

¹ Callisen.

² Webster, l. c., 223, 225, 248, 331.

³ Tennent, p. 23 (gives details of several cases).

⁴ ?

⁵ Bard.

⁶ Webster, l. c., p. 331.

⁷ Williamson.

⁸ Macbride.

⁹ Leconte.

¹⁰ Eights.

¹¹ Comstock, Leaming.

¹² Sherill.

¹³ Smith.

¹⁴ Stearns, Low, Willoughby.

¹⁵ 'Report of the Committee of Saratoga, &c.,' Waterford, 1813, Utley.

¹⁶ Bascom.

¹⁷ Hosack.

¹⁸ Mott.

¹⁹ Vaughan, Hazeltine.

²⁰ Williams, Warner.

²¹ Account in 'New England Journ. of Med.,' 1813, li, 241, Gallup.

later in the States to the west of New York.¹ There are no accounts of its epidemic prevalence in Pennsylvania; it was seen only in sporadic cases at Philadelphia (where Dr. Benjamin Rush died of it on 12th April, 1813) as well as at other places in the State. From Delaware there comes a notice of an epidemic outbreak at Newcastle² in the winter of 1813; and its prevalence among the troops of the northern division of the army of the United States is reported from a number of stations.³ In the Northern States the epidemic appears to have died out in the spring of 1815; but in the Central and Southern States—Maryland,⁴ Virginia,⁵ Kentucky,⁶ Tennessee,⁷ North Carolina,⁸ South Carolina,⁹ Georgia,¹⁰ Florida, Mississippi¹¹ (particularly at Natchez and along the eastern shore of the river) and Louisiana (particularly New Orleans)¹²—it continued to be widely spread until 1826.

In the interval from 1815-62, we meet with merely occasional notices of epidemic pneumonia in the northern regions of North America: 1816, in certain parts of Massachusetts¹³ and in Washington County, Ohio;¹⁴ 1824 and 1825, in Philadelphia, having been observed in the spring of each year, particularly in the Institution for the Deaf and Dumb in that city;¹⁵ 1853, 1854 and 1855 at Julianehab in South Greenland;¹⁶ and 1857, in Sullivan County, New York.¹⁷ It is only since 1862 that these epidemics have reappeared at all extensively. In the winter and spring of 1862-63 and of 1863-64, pneumonia was observed to be epidemic at many places in Pennsylvania, where it went on increasing until 1875.¹⁸ For New York State this latest cycle of epidemics dates from 1868; and there also they have gone on extending down to recent dates.¹⁹ A small epidemic of inflammation of the

¹ Ludlow.² Account in 'New York Med. Reposit.,' 1819, v, Nr. 2.³ Whitridge, Mann.⁴ Martin, Wright, Allen.⁵ Murphy, Hereford, Scott, Millar, Lucas.⁶ Kercheval, McCall.⁷ McCall.⁸ Millar.⁹ Davis, Tidyman, Potter.¹⁰ Id.¹¹ Kerr, Cartwright.¹² Heustis.¹³ Accounts in 'New England Journ. of Med.,' 1816, Oct., v, 321; 1817, April, vi, 203.¹⁴ Hildreth.¹⁵ Wood.¹⁶ Account in 'Sundhedscoll. Aarsberetning for 1856,' 67.¹⁷ Watkins.¹⁸ Accounts in 'Transact. of the Pennsylv. State Med. Soc.,' 1863; Corson, Newberry, Horner.¹⁹ Leaming.

lungs, confined mostly to a single English regiment, is reported from New Brunswick in the winter and spring of 1866-67.¹ In the Southern States of the Union, where the severe or typhoid forms of pneumonia have always been very common and in a sense endemic,² there had been fresh epidemic outbreaks at various parts of South Carolina since 1835;³ after a time the epidemic became more extensive, spreading to North Carolina⁴ and so northwards⁵ until it reached the Northern States, as already mentioned. Of isolated outbreaks in the Southern States during the last half century, we have accounts from Sommersville (Tenn.⁶) for the winter of 1831-32, from Whiteslow (Texas⁷) for the winter of 1871-72, and from the prison of Frankfort (Ky.⁸) for the winter and spring of 1874-75.

In these North American epidemics, the malady had almost always the typhoid or asthenic character more or less pronounced. Connecting with them we have the same type of inflammation of the lungs occurring often in Mexico, particularly among the negroes;⁹ and under the same circumstances in the West Indies (particularly in Jamaica¹⁰), on the eastern slope of the Andes in Brazil, Peru and Bolivia (very malignant epidemic of typhoid pneumonia in the winter of 1857¹¹), and along the Peruvian coast, where the malady is known as "*tabardillo y costado*" and is much dreaded.¹²

Recent epidemics in Europe.—Epidemics of pneumonia during the present century have been hardly less frequent on European soil than in the New World, although they have been mostly far apart and confined within narrow limits. From *Italy* they are reported as follows:—San Sovino,¹³ winter and spring of 1816; Pozzuoli,¹⁴ autumn of 1828; Val Tellina,¹⁵ winter and spring of 1829; Sansevero (Capitanata),¹⁶ winter of 1829; Valdinievole,¹⁷ 1873; Florence and vicinity, with other places in Tuscany,¹⁸ winter and spring of

¹ Welch.

² Webster, i, 249; Williamson; Posey; Flint, 'Amer. Journ. Med. Sc.,' 1861, Jan., p. 26.

³ Gibbs; Bailey.

⁴ Brown; Dickson.

⁵ Leaming.

⁶ Higginson.

⁷ Drake.

⁸ Rodman.

⁹ Heinemann; Vaillant.

¹⁰ Mason.

¹¹ Mantegazza.

¹² Tschudi.

¹³ Carresi.

¹⁴ Quadri.

¹⁵ Massara.

¹⁶ Alessandro.

¹⁷ Tempesti.

¹⁸ Banti.

1878; and the district of Tregnago (Verona),¹ spring of 1883.

The following are the *French* epidemics:—Tonneins (Guyenne),² autumn and winter of 1805; Martiques, Marseilles and Toulouse,³ winter and spring of 1806; a number of villages around Charleville (Champagne),⁴ spring of 1805 and 1806; several places in the department of the Var (Provence),⁵ and Tour-de-Serre a village near Besançon,⁶ winter and spring of 1807; vicinity of Clairvaux,⁷ 1808; Annecy (Savoy)⁸ and a number of villages in the arrondissement of Mayenne (Lorraine),⁹ spring of 1816; a very malignant epidemic at Troyes (Champagne),¹⁰ winter of 1826; several villages in the arrondissement of Mirecourt (Lorraine),¹¹ winter of 1827; Epfig (Alsace),¹² winter of 1831-32; Dept. Hérault,¹³ winter of 1843-44; villages in the Pyrenees,¹⁴ 1845; in the garrison of Versailles,¹⁵ winter of 1847; and in the garrison of St. Cloud,¹⁶ spring of 1865.

In *Switzerland* there were epidemics of "Alpenstich" in the spring of 1816 in the Engelbergerthal and some mountain villages in the canton of Bern;¹⁷ winter of 1832-33 in a number of the villages of Uri, Unterwalden, the upper Valais and Ticino;¹⁸ winter of 1834 in Aarau;¹⁹ and in the spring of 1840 at several places in the Limmatthal.²⁰

From the *Netherlands* we have accounts of a malignant epidemic in 1876 at Brussels,²¹ and of an outbreak in the spring and summer of 1883 among the troops garrisoning the Helder.²²

Epidemics of pneumonia in *Great Britain and Ireland* are recorded as follows:—London,²³ winter of 1805; Dublin,²⁴ 1832 and 1874; several villages in North Devon,²⁵ spring of 1875; Liverpool,²⁶ 1876-82 (unusual number of cases of pneumonia in sailors and dock-labourers, treated at the Northern Hospital, characterised by severe nervous sym-

¹ Massalongo.

² Gasc.

³ Fodéré.

⁴ Hennequin.

⁵ Fauchier.

⁶ Barrey, p. 129.

⁷ Guillon.

⁸ Carron.

⁹ Lemerrier.

¹⁰ Pigeotte.

¹¹ Mergant.

¹² Mistler.

¹³ Account in "Gaz. méd. Belge," 1843, p. 174.

¹⁴ Mourgne.

¹⁵ Masselot.

¹⁶ Worms.

¹⁷ Guggenbühl, 51, 120.

¹⁸ Id., 54, 125.

¹⁹ Zschokke.

²⁰ Zweifel.

²¹ Barella.

²² Janssens.

²³ Bateman.

²⁴ Hudson, Grimshaw and Moore.

²⁵ Blyth.

²⁶ Caton.

ptoms) ; Scunthorpe¹ (Lancashire), spring of 1878 (confined to certain streets) ; and Dingwall,² Ross-shire, spring of 1883 (also limited in distribution).

The following are the *German* epidemics, many of them of a typhoid character :—Freiburg-on-the-Unstrut and vicinity,³ Frankenstein (Silesia),⁴ Stolberg and vicinity,⁵ and Baden⁶ (near Vienna), winter and spring of 1803 ; Oldenburg,⁷ 1808 ; Husum and adjoining districts,⁸ spring of 1810 and 1811 ; Lucha,⁹ summer of 1812 ; district of Bruck and other mountainous parts of Styria,¹⁰ winter and spring of 1813 ; Marktheidenfeld (Bavaria),¹¹ winter and spring of 1835-36 ; Goslar¹² and Halle,¹³ winter of 1839 ; garrison of Sommerfeld,¹⁴ winter of 1850-51 ; Köstenbach¹⁵ (Nassau) and Liebenzell (Württemberg),¹⁶ winter and spring of 1858-59 ; convict prison of Moringen (Hanover),¹⁷ winter and spring of 1875-76 and of 1877-78 ; garrison of Wesel,¹⁸ 1875 ; garrison of Cologne,¹⁹ village of Ober-Sitke in Brunswick,²⁰ prison of Amberg (Upper Palatinate²¹) and villages near Echte (Hanover), winter of 1880, and in the last mentioned, also slight epidemics in the two years following ;²² villages of Becherbach (Homburg)²³ and Lustnau (Tübingen²⁴), and Artern and vicinity,²⁵ spring of 1881 ; Zang near Königsbronn (Württemberg²⁶), spring of 1882 ; Sechshausen²⁷ near Vienna, and village of Erbenheim (Wiesbaden²⁸), autumn of 1882 ; and in the garrison of Schwerin²⁹ during the winter of 1882-83.

From the *Northern Kingdoms* we hear of epidemics in the spring of 1812 in Jutland³⁰ (same time as in Schleswig) ; in the spring of 1824 among the garrison of Stockholm ;³¹

¹ Couldrey.² Bruce.³ Ortel.⁴ Gebel.⁵ Kortum.⁶ Schenk.⁷ Gramberg.⁸ Friedlieb, Esmarch.⁹ Königsdörffer.¹⁰ 'Beob. und Abhandl. österreich. Aerzte,' 1821, ii, 32.¹¹ Hergenröther.¹² Fischer.¹³ Bertram. In the spring of 1841 it happened to me to see many cases of so-called pneumo-typhus in the Danzig Hospital. In 1839, there were under treatment in it 66 cases of that sort, of which 25 were fatal.¹⁴ Ulrich.¹⁵ Kremer.¹⁶ Schroter.¹⁷ Kühn.¹⁸ Koehnborn, Kranz.¹⁹ Knoevenagel.²⁰ v. Holwede.²¹ Kerschensteiner.²² Riesell.²³ Butry.²⁴ Schœff.²⁵ Penkert.²⁶ Schmid.²⁷ Langer.²⁸ Senft.²⁹ Knoevenagel, l. c., 1883.³⁰ Friedlieb.³¹ Ekelund.

in the summer of 1826 at Dannemore, a village near Enköping;¹ slight winter epidemics in 1863 and 1869 at Eidsvold (Norway²); in the winter and spring of 1866 at the prison of Akershus (Christiania³); and from 1874 to 1879, at many places in Norway.⁴ I know of only two or three references to epidemic pneumonia (severe or typhoid variety) in regions of the Eastern Hemisphere beyond Europe. In India, and in Bombay particularly, "asthenic" inflammation of the lungs is said by Morehead to be "sufficiently common," especially among the natives; there are also notices of two epidemics in the Punjab, in the autumn of 1875⁵ and winter of 1882,⁶ in both instances among the English troops. For Tahiti there is mention made of the frequent occurrence of pernicious pneumonias.⁷

§ 44. INFLUENCE OF SEASON AND WEATHER, PARTICULARLY SUDDEN CHANGES.

Coming now to inquire into the influence exerted by exterior conditions, such as climate, season, weather, soil and sanitation, in originating and spreading inflammation of the lungs and determining its type, we have first of all to keep in view that pneumonia, even in its narrowest acceptance of fibrinous or so-called croupous pneumonia, is an anatomical term that includes several inflammatory processes differing from one another in their etiology, the difference being indeed expressed to some extent in the clinical characters of the malady, in its type and its course, and in certain fine shades of distinction in the *post-mortem* state of the lungs. It is only of recent years that the subject has been investigated thoroughly and on all sides. And although satisfactory conclusions on all the questions relating to it have not yet been come to, and the well-grounded opinions of former times have even had to make room for certain one-sided and erroneous conceptions of the day;⁸ yet the results got from

¹ Bäckström.

² Thoresen.

³ Dahl.

⁴ Holmsen; Löberg.

⁵ Costello.

⁶ Giles.

⁷ Ref. in "Arch. de méd. nav.," 1865, Oct., p. 288.

⁸ Among which I reckon the doctrine advocated particularly by Jürgensen that

inquiry thus far, enable us to entertain more definite views of the term "pneumonia," not merely from the clinical and anatomical standpoint, but from the etiological also.

Although the *geographical position* cannot be shown to have much to do with differences in the diffusion of pneumonia over the globe, yet the amount of the sickness depends very decidedly upon certain influences of *season* and *weather*, as the table on the next page will show.

According to the table, the largest number of cases falls in the months from February to May: February being the maximum month for Philadelphia and for Bombay, March for Bavaria (Munich) and for Paris, April for Falun, Frankfurt, Berlin, Vienna and Basel, and May for Stockholm, Copenhagen, Meissen and Thuringia. The smallest number of cases is from July to September: July being the minimum month for Falun, Meissen, Basel and Bombay, August for Stockholm, Copenhagen, Thuringia, Bavaria (Munich), Vienna and Paris, and September for Berlin, Frankfurt and Philadelphia. Taking the average for all these places, 34.7 per cent. of the patients were attacked in spring, 29.0 in winter, 18.3 in autumn, and 18.0 in summer; the combined percentage for winter and spring being 63.7, and for summer and autumn 36.3. If the number of cases in summer be taken as 1, then autumn has 1.02, winter 1.6, and spring 1.9. In complete agreement with this result is the observed preponderance of inflammation of the lungs in winter and still more in spring, in all parts of the world:—the Iberian peninsula,¹ Turkey,² Greece,³ Syria,⁴ many parts of India,⁵ the Mozambique coast,⁶ the Cape,⁷ the West Coast of Africa,⁸ Senegambia,⁹ the Greater Soudan,¹⁰ Algiers,¹¹ Canada,¹² Ohio,¹³ Tennessee,¹⁴ Georgia,¹⁵ Alabama,¹⁶ Texas,¹⁷ "pneumonia is an infective disease." Whatever is true in that is not new, and whatever of it is new is not true.

¹ Brandt, Wallace, and others (compare note 5 on p. 118).

² Sandwith, Rigler, Beyran.

³ Valassopoulos.

⁴ Tobler.

⁵ Webb, Morehead, Don, Hunter.

⁶ Ref. in 'Arch. de méd. nav.' and Roquete, l. c.

⁷ Scherzer.

⁸ Daniell, McRitchie.

⁹ Berger, Defant.

¹⁰ Quintin.

¹¹ Haspel, Deleau.

¹² Smith, 'Edin. Med. Journ.,' 1866, July, p. 1.

¹³ Hildreth.

¹⁴ Bailey, 'Philad. Med. and Surg. Reporter,' 1871, June, p. 453.

¹⁵ Posey.

¹⁶ Heustis.

¹⁷ Crawford, 'Med. Rep. on the U. S. Army,' 1859, p. 386.

Table of percentages of Pneumonia in the several months.

Place.	General population, or in hospital.	Period.	Cases or Deaths.	December.	January.	February.	Winter.	March.	April.	May.	Spring.	June.	July.	August.	Summer.	September.	October.	November.	Autumn.
Falun ¹ .	.	1854-66	Cases	6.5	10.4	11.2	28.1	11.0	14.3	13.6	38.9	6.9	3.7	4.9	15.5	4.1	6.6	6.8	17.5
Stockholm ² .	.	1840-55	"	10.0	7.2	8.0	25.2	9.3	13.3	15.6	38.2	9.7	5.7	3.8	19.2	4.9	5.7	6.8	17.4
Copenhagen ³ .	.	1843-47	"	5.0	6.9	12.5	24.4	10.5	11.5	14.6	36.2	8.0	7.6	3.8	19.4	4.7	6.5	8.4	19.6
Berlin ⁴ .	Town	1869-82	Deaths	9.0	9.7	9.3	28.0	10.0	10.3	10.2	30.5	8.9	7.5	5.9	22.3	5.3	6.6	7.3	19.2
Meissen ⁵ .	Country	1867-72	Cases	6.7	10.5	9.3	26.5	11.0	11.3	12.3	34.6	8.3	5.5	5.7	19.5	5.7	6.2	7.5	19.4
Thuringia ⁶ .	"	1873-75	"	7.1	6.6	8.2	22.0	11.7	11.4	14.2	37.3	9.7	6.4	4.6	20.7	5.3	5.8	8.9	20.0
Frankfurt ⁷ .	Town	1863-83	Deaths	8.3	10.2	11.8	30.3	11.9	13.7	11.8	37.4	7.2	5.9	4.0	17.1	3.8	5.6	5.8	15.2
Bavaria ⁸ .	Country	1868-72	"	9.5	11.2	11.6	32.3	12.8	11.6	9.2	33.6	6.6	4.9	4.5	16.0	4.9	6.3	7.9	19.1
Munich ⁹ .	Hospital	1864-83	Cases	8.5	11.8	11.9	32.2	12.9	12.4	11.6	36.9	7.2	4.3	3.7	15.2	3.8	5.5	6.5	15.8
Vienna ¹⁰ .	"	1847-57	"	8.5	9.7	9.2	27.4	11.6	13.1	13.0	37.7	8.1	5.9	3.9	17.9	4.6	5.1	7.2	16.9
Basel ¹¹ .	"	1873-82	"	10.6	13.7	12.8	37.1	12.7	14.2	7.9	34.8	6.0	3.1	3.9	13.0	3.2	4.0	7.9	15.1
Paris ¹² .	Town	{ 1865-69 } 1872-75	Deaths	9.5	11.3	10.7	31.5	12.0	11.4	9.7	33.1	6.7	5.3	4.8	16.8	4.8	5.7	8.0	18.5
New York ¹³ .	"	1807-26	"	—	—	—	31.9	—	—	—	33.4	—	—	—	16.2	—	—	—	18.5
Philadelphia ¹⁴ .	"	1857-60	"	11.1	10.9	11.2	33.2	10.5	10.9	9.3	30.7	6.6	6.0	5.2	16.8	4.2	6.0	9.0	19.2
Bombay ¹⁵ .	Hospital	1848-53	Cases	11.0	9.7	12.6	33.3	10.3	8.7	8.7	27.7	7.4	3.0	6.0	16.4	6.8	9.4	6.5	22.7

¹ Hallin, l. c.² Huss, l. c., 67.³ Hannover, 'Statist. Undersögeler, &c.,' Kjöbenhavn, 1858, 276.⁴ 'Statist. Jahrb.' and 'Bewegung der Bevölkerung der Stadt Berl., 1869-78,' Berl., 1884.⁵ 'Jahresber. des Medicinalcoll. im König. Sachsen.'⁶ Lübben, 'Die Krankh. Thüringens, &c.,' Strassb., 1880, 23.⁷ 'Statist. Mittheil. über den Civilstand der Stadt Frankfurt-a-M.' Klinger, 'Bayer ärztl. Intelligenzbl.,' 1874, Nr. 35, 327.⁸ Seitz, ib., 1884, Nr. 33, 367.⁹ Rychner, 'Ueber die in den Jahren 1873-82 im Bürger-Spital Basel beobachteten croupösen Pneumonien,' Basel, 1884.¹⁰ Chausseaux, 'Rech. statist. sur la mortalité de la pneumonie à Paris, &c.,' Par., 1878.¹¹ Niles and Russ, 'Medical Statistics, &c.,' New York, 1827.¹² Morehead, 'Transact. of the Bombay Med. Soc.,' 1855, n. s., ii, 3.¹³ Jewell, 'Amer. Journ. of Med. Sc.'

California,¹ the West Indies,² Guiana,³ Monte Video,⁴ Chili,⁵ and the Peruvian coast.⁶

We have already seen that nearly all the epidemics of pneumonia had occurred in winter and spring.

Instances of epidemics of pneumonia in summer or autumn are those of Imola in 1602, Feletto (Turin) in 1713, Belle-Isle-en-mer in 1755, Atwerp in 1757, Langon and Copenhagen (on board the Danish fleet) in 1779, Vitry-le-Français in 1786, Freiburg-on-the-Unstrut in 1802, Lucha and Westchester County N. Y. in 1812, Philadelphia (deaf and dumb institution) in 1824, Dannemore (Sweden) in 1826, Puzzuoli in 1828, Punjaub (among British troops) in 1875, Sechshausen and Erbenheim in 1882, the Helder garrison (Holland) in 1883. These are but rare exceptions to the rule. Gibbes, indeed, says of the endemic or epidemic prevalence of pneumonia in the Southern States of the American Union, and in South Carolina in particular, that the disease happens equally "in all sorts of weather, even in midsummer or the pleasant time of spring and autumn;" but he is contradicted not merely by the epidemiographical records, but also by the explicit statements of Posey, Dickson, Cartwright, Potter and other observers in that part of the world, who are of one accord in designating winter and spring as the proper season of pneumonia.

We may with all confidence conclude from this very pronounced association of pneumonia, whether sporadic or epidemic, with winter and spring, that the origin of the malady is dependent on weather-influences proper to those seasons, and more particularly upon sudden changes of temperature and considerable fluctuations in the proportion of moisture in the air. That conclusion finds support in the opinion expressed by many observers in all parts of the world, that the number of sporadic cases of pneumonia, as well as the extent and severity of its epidemics, is in direct proportion to the degree in which these influences, the changes of temperature in particular, make themselves felt, and that any exceptionally large number of cases of inflammation of the lungs at other seasons, more especially in summer, has coincided with the prevalence of the same meteorological conditions phenomenally at that season.⁷

¹ Blake.

² Chisholm, Morelet, Hunter.

³ Bajon.

⁴ Férís.

⁵ Lafargue, Schneider.

⁶ Smith, Tschudi.

⁷ See the papers of Cartellieri ('Oester. med. Jahrb.,' 1843, ii, 353) relating to the circle of Leitmeritz in Bohemia; of Hampeis for the Bukowina; of Didelet ('Hist. de la soc. de méd. de Paris,' ii, 136) for the Vosges; of Menis for Brescia; of Tobler for Syria; and of Sigaud and Rendu for Brazil.

But that conclusion is still further borne out by the fact that in those northern regions (Russia, Sweden, Denmark, Germany, England, North of France, and Northern States of the American Union) where the most sudden and severe changes of temperature fall in spring, the largest number of cases is met with in spring also; while in the warmer and subtropical countries (Italy, islands of the Mediterranean,¹ Spain and Portugal, Greece, Algiers, Southern States of the Union, Chili and Peru), which are subject to those meteorological influences for the most part in winter, it is winter that represents the proper season of pneumonia. And that applies not merely to sporadic cases, but in part at least to epidemic outbreaks of the malady as well. One other fact deserves to be noticed here: namely, that those tracts of country, especially in the tropics, which are highly favoured in their climate, or in the steadiness of the temperature from day to day (Egypt, many parts of India, including Bengal and the plain of Burma, California, &c.), are subject to pneumonia to a comparatively slight extent.

Huss, writing of Sweden, says, l. c., p. 68: "During the spring months the fluctuations of temperature are the greatest, not only from day to day, but also as between the several hours of the day and especially as between the day and the night. Those changes would appear to be the most obvious predisposing causes for the development of pneumonia. . . . It is in the month of May that we usually find the most rapid changes of temperature, both from day to day and still more as between noon and evening; and it is in that month that the pneumonias are most frequent. If May be characterised by a continuous tract of cold weather, and there be no sudden changes, there appears to be no effect produced in the way of exciting inflammations; but that result follows if there be somewhat high temperature with rapid transitions to a lower. . . . The conclusion would run accordingly [from instances given by the author, but omitted here] that the greater the range of temperature has been in the month of May, the larger the number of cases; and the less considerable those changes have been, the fewer attacks of pneumonia. And a study of the other months of the year leads very nearly to the same result. . . . During the winter months (December, January, February), chills are in fact slight, and probably due for the most part to the considerable difference between the temperature indoors and in the open air; the fluctuations in the external temperature are neither so frequent nor so sudden as in the month following; and therefore there

¹ Thus Font (l. c.) says of Minorca: "The disease is prevalent here every year, mostly in winter; sometimes also in spring, if the weather continue wintry."

are fewer inflammations of the lungs in winter than in spring and early summer."

Eschbaum¹ concludes, from observations made in Bonn in the years 1865-79, that "fluctuations of the temperature, as well as low temperature with much moisture in the air, are highly conducive to pneumonia." Schramm² reasons from experience at various places in Bavaria in 1863, 1866 and 1867 that "pneumonias occur, even when the temperature is not low, and the more frequently the greater its range, the oftener the weather changes in correspondence therewith, the sharper the contrasts from warm to cold days and from dry to wet, the oftener and the more perceptibly the wind changes, and the stronger and rougher it blows. . . . On the other hand I think that I may conclude from the weather-observations of 1866 that pneumonia is the less frequent the smaller the curves made by a temperature that is not absolutely low, the more uniform the weather continues throughout a whole season or a whole month, be it damp or dry, mild or cold." Klinger,³ basing on the statistics of pneumonia mortality in Bavaria from 1868-72, says: "We shall hardly err if we assume that the number of cases increases the more the temperature fluctuates and the more suddenly it alters, and that it decreases under the converse circumstances."

Chanseaux⁴ makes a comparison of the death-rates from pneumonia in Paris in the years 1865-75, and the kind of weather observed in the several months during that period; and sums up as follows: "It will be noticed in these tables that the largest number of deaths from pneumonia corresponds exactly to the seasons with the most abrupt oscillations of temperature and the most considerable atmospheric vicissitudes." Speaking of India, Gordon says: "Of real consequence for the development of pneumonia are great changes of temperature, such as occur in various parts of the country, for example, in the North-West Provinces, where sudden descents from 94° to 80° (in the cold season) are not uncommon." There are statements to the same purport from many other tropical or subtropical countries, such as Japan,⁵ Australia (Sydney),⁶ the Cape,⁷ Mayotte,⁸ Senegambia,⁹ the southern part of the west coast of Africa,¹⁰ Mexico¹¹ and Chili.¹²

Referring to the epidemic of pneumonia in Bell-Isle-en-mer in the summer of 1755, Rochard says that the disease, which is on the whole not common there, was observed on that occasion in a detachment of troops who were necessarily

¹ 'Beiträge zur Statistik einiger acut entzündlichen und Infectionskrankheiten,' Bonn, 1880, 15.

² 'Bayer. ärztl. Intelligenzbl.,' 1876, 203.

³ *Ib.*, 1874, 327.

⁴ *L. c.*, 14.

⁵ Godet, *l. c.*, 54.

⁶ Bourse, *l. c.*

⁷ Egan, *l. c.*

⁸ Grenet, *l. c.*

⁹ Borius, Berger, *ll. cc.*

¹⁰ McRitchie, 'Edinb. Monthly Journ. of Med. Sc.,' xiv, 1852, May, 405.

¹¹ Jourdanet, *l. c.*

¹² Ref. in 'Arch. de méd. nav.,' 1864, Août, 103; Boyd, *l. c.*

exposed to very bad weather, with cold north-west winds. Welch gives the following fact in connexion with the epidemic during the winter and spring of 1866-67 among the troops stationed in New Brunswick: The disease occurred in a battalion that had been stationed six years in a Mediterranean garrison, and had come direct from there into the rough North American winter. Three hundred and thirty men of the battalion were quartered in a wooden building which had been run up for an exhibition, excellently adapted no doubt for living in during the summer, but in winter affording no sufficient protection from the weather, as it was exposed on all sides and the wind found its way into the rooms through the thin walls and the numerous slits and holes in them. Two hundred and fifty-six of the men lived in a solidly built, well sheltered barrack, and sixty-six married men were lodged in the town. Of those occupying the exhibition building, thirty-eight fell ill of pneumonia, while of the rest only three had attacks of inflammation of the lungs which could be traced to the weather. The greatest sufferers were those living in the upper storey of the wooden building, who were most exposed to the cutting winds from the north and west. "There is no doubt," says Welch, "that the exciting cause of these attacks was exposure of the body during the night to cold currents of air and lowness of general temperature." In several other epidemiographical papers on pneumonia, it is expressly remarked upon that the extent and severity of the epidemic were definitely influenced by the more or less unfavorable nature of the weather.

§ 45. INFLUENCE OF A WET SOIL.

It is from the point of view stated in the preceding paragraph that we have to estimate the influence exerted by *the state of the soil* upon the occurrence of pneumonia. Elevation and configuration, situation on the coast or in the interior, geological character and the like, are all irrelevant in themselves; they have a significance for the pathogenesis only in so far as they determine the climate or the sort of weather in any locality; and it is by keeping that fact in

mind that we may explain the contradictory conclusions which have been arrived at through attending too rigidly to each of the factors named, as if it could be an element in the causation by itself.

A real importance has been assigned by some observers to the *amount of moisture in the soil*, and to the *fluctuations of the subsoil water*, as influencing the processes of decomposition in the soil. Thus, Penkert tells us that in the epidemic of 1881 in the village of Artern, whereof the school was the starting-point, the malady appeared among the children in consequence of the wind carrying into the school-rooms, from the graveyard adjoining, cadaveric gases (along with some infective thing) which had developed in the porous soil after the subsoil water had fallen from a high to a low level. Kranz points out that the epidemic of 1875 among the troops garrisoned in Wesel was prevalent during very dry weather with a low level of the ground-water, and that it came to an end abruptly in the beginning of May with the setting in of heavy rains: not only were the decomposition-processes in the ground brought to an end, he thinks, by the torrents of rain, but also "the moulds and bacterial fungi with their spores," were thrown to the ground and made innocuous, instead of being suspended in the air and inhaled by the breath. The polemic of Kranz is directed against Köhnborn, who, in treating of the same epidemic, agreed with him in looking for its cause in the soil, but held that it developed under the form of a miasma, and that the weather-conditions above mentioned had been without any influence on the events. One point he makes against Kranz that, if it had really been the want of rain or the dryness of the ground that had caused the virus of the disease to develop, it would be hard to understand why the epidemic was confined to one barrack, and that too the least elevated in situation, while all the rest of the town, standing on soil equally dry, should have escaped.

Knœvenagel assigns the outbreak at Schwerin in 1882-83 to the same cause as Kranz: "The cases occurred in localities that were justly under suspicion as to their salubrity, both in respect of the soil and of the erections upon it. None the less, although these conditions had existed before, there had

been no unusual amount of sickness. There must have been "something else," therefore, co-operating; and I would look for that factor in a combination of prolonged absence of moisture from the air, or from the soil (low level of the surface-water and ground-water), with a high barometer in January and February." The same conclusion respecting the importance of the degree of soil-moisture for the production of the disease has been come to by Keller,¹ in his statistical inquiry into the relation between the number of cases (503 in all) and the amount of rainfall, his observations having been made in 1873-81 at the policlinic of Tübingen, which included a part of the town and the neighbouring village of Lustnau. He sums up his inquiry as follows: "The mortality from croupous pneumonia is shown to depend to a great extent on the coincident rainfall; a slight rainfall favours the development of croupous pneumonia, while heavy rains restrain it. . . . The level of the subsoil water depends essentially [but that is doubtful] on the amount of moisture precipitated from the air. . . . The saturation of the ground is dependent on the one hand upon the quantity of rain and on the other hand upon the height of the subsoil water. . . . Comparative wetness of the ground is against the development of pneumonia; a relative degree of dryness favours it; a moderate prevalence of pneumonia corresponds to an average amount of water in the soil. If it be desired, in connexion with modern theories of the nature of infective matters, to utilise that fact for a more general conclusion, the following will suggest itself as the most likely and the easiest understood: the poison of pneumonia is of an organic nature (micro-organisms), and its medium is the subsoil of inhabited houses." Seitz,² also, has come to that conclusion from a study of all the cases of pneumonia treated during twenty years in the hospitals of Munich; but, like Keller, he denies the influence of lowered or heightened atmospheric pressure on the number of cases; whereas Lorenz,³ working with very cumbrous statistics, is led to think that "the most

¹ "Zur Aetiologie der croupösen Pneumonie," in Jürgensen's 'Croupöse Pneumonie: Beobachtungen aus der Tübinger Poliklinik,' Tübing, 1883.

² 'Bayer. ärztl. Intelligenzbl.,' 1884, No. 33.

³ *Ib.*, 1884, No. 39.

important factor in the disease is an upward movement (under lowered barometric pressure) of the air in the soil, the same being tainted with organised disease-germs."

Although I am far from wishing to deny, in view of these facts, the influence of locality, or, in a narrower sense, even of the soil, upon the origin of pneumonia, yet I hold that the interpretation put by the above observers (and by others who have written to the like effect) upon the manner of that influence, needs further proving. For all the great epidemics, spread over wide tracts of country, whose nosological peculiarities I shall briefly refer to, that theory of the origin of the disease (influence of soil-conditions) is absolutely out of the question, inasmuch as these epidemics have been prevalent equally in dry weather and in wet, and on low and damp soil as well as on elevated and dry ground. But I shall not urge that point as evidence against the theory, for the reason that I may be answered, and in my view justly answered, that we have to do in epidemics of that kind with a peculiar form of pneumonia.

But, confining ourselves to things that may be measured by the same standard, the theory will not do at all. I have abstracted in the following table the deaths¹ from pneumonia at Berlin in each month from 1873 to 1882, adding the amount of the rainfall and the level of the subsoil water in two columns alongside.

¹ The objection may be taken to the use of mortality figures for this purpose, that the commencement of many cases which ended fatally within the month, had fallen in the month before. I must admit the justice of that objection; but I think that the error we thus introduce into statistics on a very large scale is too slight to affect the result materially. It weighs much more with me that the *whole* of the fatal cases of pneumonia are included in the figures, both the infective and those due to chill; that the results, accordingly, do not decide at all whether the cases of infective pneumonia are dependent on influences of the soil, and if so, to what extent. The same source of error, however, is present in the figures relied on by Keller and Seitz. I am perfectly justified, therefore, in bringing the conclusions of my inquiry into comparison with the results obtained by those gentlemen, so far as concerns the point that is here chiefly in question.

Table of Deaths from Pneumonia at Berlin according to months, with the corresponding Rainfall and level of the Subsoil water.

	1873.			1874.			1875.			1876.			1877.		
	R. ¹	Ss. ²	D. ³	R.	Ss.	D.	R.	Ss.	D.	R.	Ss.	D.	R.	Ss.	D.
January	11'0	1'90	168	17'1	1'66	111	39'0	1'37	113	8'7	1'81	214	27'8	1'59	116
February	5'4	1'91	158	7'1	1'71	102	9'6	1'52	147	38'1	1'91	183	55'0	1'78	108
March	19'0	1'93	149	28'0	1'75	127	12'3	1'57	172	59'5	2'33	160	17'3	2'06	139
April	6'4	1'98	150	13'5	1'85	100	10'4	1'76	119	14'0	2'53	146	8'1	2'21	119
May	23'3	1'87	182	20'5	1'87	108	31'2	1'80	145	6'0	2'22	152	15'0	2'09	162
June	21'6	1'75	122	20'4	1'71	94	28'0	1'63	104	28'1	1'96	136	16'2	1'90	139
July	41'0	1'64	108	12'4	1'52	94	20'1	1'56	92	20'8	1'75	83	21'1	1'69	117
August	19'0	1'56	80	22'1	1'38	78	14'0	1'41	106	14'1	1'55	86	52'6	1'49	74
September	19'9	1'49	66	8'7	1'29	61	11'0	1'32	87	31'2	1'43	69	21'9	1'50	62
October	13'8	1'48	74	6'2	1'23	72	56'7	1'29	90	7'6	1'37	90	16'6	1'47	100
November	18'0	1'50	90	9'5	1'82	106	31'4	1'46	92	26'3	1'40	117	13'0	1'47	82
December	21'3	1'61	120	24'8	1'27	112	14'8	1'65	124	17'0	1'48	104	15'6	1'56	110
Total			1467			1165			1391			1540			1328

	1878.			1879.			1880.			1881.			1882.		
	R.	Ss.	D.	R.	Ss.	D.	R.	Ss.	D.	R.	Ss.	D.	R.	Ss.	D.
January	18'6	1'62	141	30'5	1'52	158	9'6	1'79	168	10'9	1'96	169	12'7	1'74	178
February	6'6	1'73	143	31'4	1'64	141	12'3	1'93	166	13'4	1'99	122	10'2	1'62	161
March	43'3	1'87	178	22'7	1'92	162	6'3	2'04	178	34'2	1'97	161	21'3	1'44	153
April	16'8	2'04	178	25'7	2'13	204	10'7	2'09	189	1'9	2'04	195	11'3	1'72	188
May	20'1	1'97	145	6'6	2'10	181	6'7	1'91	191	16'9	2'14	176	26'0	1'66	212
June	30'4	1'82	132	17'6	1'91	119	44'9	1'63	207	24'6	1'71	185	39'7	1'60	175
July	30'9	1'67	115	32'8	1'75	103	29'2	1'47	129	21'0	1'83	172	83'5	1'51	159
August	33'3	1'55	78	22'6	1'65	90	18'6	1'42	113	33'0	1'52	142	29'2	1'62	111
September	11'3	1'49	76	9'7	1'48	102	23'8	1'34	111	20'6	1'61	121	33'6	1'70	101
October	9'8	1'44	110	15'6	1'44	97	32'3	1'35	133	19'0	1'63	145	14'6	1'75	113
November	9'3	1'43	123	26'7	1'39	118	17'4	1'44	129	15'2	1'60	157	37'9	1'92	132
December	16'4	1'46	131	11'9	1'47	157	49'2	1'66	150	13'3	1'66	175	18'3	2'04	140
Total			1150			1632			1864			1920			1823

From these figures it follows :—

(1) That there is no definite relation discoverable at Berlin between the monthly rainfall and the number of deaths from pneumonia in the corresponding month ; or, in other words, that the maximum of the sickness by no means coincides with the time of smallest rainfall, or conversely, the minimum of sickness with the time of heaviest rains.

¹ Rainfall in Paris lines.

² Height of the sub soil water (conventional standard).

³ Total deaths from pneumonia.

Taking the five driest and the five wettest of each of the months during the ten-years period, the total cases of pneumonia (15, 680), distribute themselves as follows:—

Table of the Mortality from Pneumonia, and of the Rainfall for the five driest and five wettest of each of the months in ten years (Berlin).

	Five driest.		Five wettest.	
	Deaths.	Rainfall.	Rainfall.	Deaths.
January	897	8'7 to 12'7	17'1 to 39'0	639
February	711	5'4 to 10'2	12'3 to 55'0	720
March	791	6'3 to 21'3	22'7 to 59'5	788
April	772	1'9 to 10'7	11'3 to 25'7	816
May	862	6'0 to 15'0	20'1 to 31'2	792
June	659	16'2 to 24'6	28'0 to 44'9	754
July	558	12'4 to 21'1	29'2 to 83'5	614
August	463	14'0 to 22'1	22'6 to 52'6	495
September	392	8'7 to 19'9	20'6 to 33'6	464
October	459	6'2 to 14'6	15'6 to 50'7	565
November	597	9'7 to 17'4	18'0 to 37'9	549
December	697	11'9 to 16'4	17'0 to 49'2	626

(2). The Berlin figures show farther, in opposition to the conclusions of Keller, Seitz, Lorenz, and others, that the largest number of cases in that capital has emphatically fallen in the time of highest level of the subsoil water.

Table of the Subsoil-water Level and Pneumonia Mortality (Berlin).

Year.	Lowest six months.		Highest six months.	
	Deaths.	Subsoil water.	Subsoil water.	Deaths.
1873	547	1'48 to 1'64	1'75 to 1'98	920
1874	529	1'23 to 1'66	1'71 to 1'87	636
1875	580	1'29 to 1'46	1'52 to 1'80	811
1876	549	1'37 to 1'75	1'81 to 2'53	991
1877	544	1'47 to 1'59	1'59 to 2'21	784
1878	659	1'43 to 1'62	1'67 to 2'04	891
1879	673	1'39 to 1'64	1'65 to 2'13	959
1880	822	1'34 to 1'63	1'66 to 2'09	1042
1881	925	1'52 to 1'71	1'83 to 2'14	995
1882	971	1'44 to 1'66	1'70 to 2'04	852

This preponderance of the disease in Berlin at the times when the subsoil water is highest, is to be explained, not by

the saturation of the ground, but merely by the fact that the highest levels of the ground-water in that city occur almost without exception in the months from January to May, these being the months characterised by the states of temperature, and perhaps also of hygiene, that have been referred to above as determining the prevalence of pneumonia.

§ 46. INSANITARY SURROUNDINGS FAVORABLE TO EPIDEMIC PNEUMONIA.

Although it would seem, then, that we can come to no certain decision as to whether conditions of soil regulate the development of pneumonia, and if so, in what manner; there can be no question, on the other hand, that the origin of the malady is associated, under certain circumstances, with *influences of locality*, more especially with the *noxious influences proceeding from bad sanitation*,—overcrowding of rooms, want of adequate ventilation, accumulation of decomposing organic matters, and the like; or, in other words, with all those errors of hygiene which are well calculated to further the development of infective diseases in general. In evidence hereof there is not only the epidemic outbreak and prevalence of pneumonia in confined and circumscribed buildings,—barracks, prisons, and such like—where the factor in question has been peculiarly noticeable at the time of the outbreak and so long as it lasted; but also the fact that in a number of epidemics which have spread over whole villages, those streets or houses have suffered most that were principally exposed to the particular harmful influences.

Dahl observes that, in the epidemic of 1866-67 in the convict prison of Akershus (Christiania), where 63 prisoners took pneumonia out of a total of 360, and 6 attendants besides, there being not a single case in the common prison of the city, the real reason for the outbreak had to be sought for in the excessive crowding and bad ventilation of the sleeping quarters; and that explanation is made all the more reasonable by the fact that Boeck had found the disease to become epidemic in 1847 under the same detrimental condi-

tions. There is a resemblance also to the outbreak of infectious pneumonia in 1875 at the convict prison of Frankfort, Kentucky, in which the cells occupied by the convicts were full of filth of every kind and the air literally tainted. Rodman's description of the hygienic state of the establishment and of the management of the convicts, on whom cleanliness had to be enforced by the lash, reveals a frightful condition of things. Again, in the epidemic of 1875 at the convict prison of Moringen, overcrowding could be shown, according to Kühn, to be the cause of the disease; the epidemic ceased when the cells were cleared out and ventilated. At the deaf-and-dumb institute of Philadelphia, pneumonia broke out in the spring of 1874 at a time when the building was greatly overcrowded and badly ventilated. Knoevenagel shows that most of the cases in the epidemic of 1879-80 among the garrison of Cologne occurred in barracks that were badly ventilated and full of putrid effluvia. In like manner in the epidemic among the soldiery at Magdeburg in 1873-74, the visitation fell mostly upon one barrack ("Mark") which was far behind all the rest in its sanitation (Grundler). An inquiry held upon three ships of the English Mediterranean fleet, in which pneumonia had been epidemic in 1860-61, brought out the fact that the sleeping quarters of the crew on the lower deck had been crowded to excess, that they were damp and ill-ventilated, and that there was a collection of black stinking water in the bilges; the crews were transferred to other ships with the best results.

Concerning the influence of the same sort of noxious conditions upon the development of pneumonia as an epidemic in particular streets or houses, we have the statements of Kaurin¹ for Norway, of Fischer for the Goslar epidemic of 1839 (the disease having occurred mostly in crowded, narrow and filthy streets), of Ward² in an account of pneumonia in West Cumberland, and of Raven for Broadstairs. Several observers, including Waterfield,³ Le Gendre,⁴ Jenner

¹ 'Norsk Mag. for Lægevidensk,' 1878, viii, 535.

² 'Lancet,' Sept., 1884, p. 487.

³ 'Med. Times and Gaz.,' April, 1874, p. 373.

⁴ 'L'Union méd.,' No. 19, 1883, p. 217.

and Moore, have seen persons attacked with pneumonia when sewer gas has found its way into the house. Lastly, it may be pointed out that the greater prevalence of inflammation of the lungs in the colder months of the year finds an explanation in the same hygienic errors, which people not unfrequently fall into in their endeavours to protect their living-rooms and bedrooms from the inclemency of the weather.

We are unable for the present to form any opinion of the manner in which this etiological factor becomes effective in setting up the disease. Experience shows, however, that the proper morbid cause is neither associated necessarily with it, nor absolutely dependent upon it. In several of the buildings referred to above, the very same sanitary defects under the influence of which the disease broke out, had often been present before without giving rise to infectious pneumonia. Again, the same kind of bad hygiene had been rampant beyond the foci of the epidemic although there was not a single case of pneumonia associated with it. On the other hand, in several of these local epidemics, such as the groups of cases in single families reported on by Daly, Patchett, Heitsch and others, as well as in the Amberg prison-epidemic described by Kirschensteiner, the sanitary state of the affected habitations was thoroughly good, in fact a model of excellence; and in many of the epidemics which have spread over wide districts, or a number of towns, or extensive tracts of country, the classes of the people living under the best sanitary conditions were by no means exempted from the visitation. The importance that we can assign to the influence of these defects upon the development of the malady is, accordingly, but a secondary one; either its effect is to create a predisposition in the individual to take the disease, or to intensify a predisposition already there; or it creates a soil specially adapted for the development of the proper morbid agent.

§ 47. NEGROES IN A COLDER CLIMATE PECULIARLY SUBJECT.

Finally we have to take note, in a review of the etiology, of the influence which circumstances of *race* or *nationality*

exert on the amount of the sickness. While the immigrants from northern latitudes to subtropical or equatorial regions enjoy a comparative immunity from inflammation of the lungs, the natives of the tropics, and most of all the negroes, are subject to the malady in a quite peculiar degree, not merely when they go to live in colder regions, but also within the countries of their birth. This holds good for sporadic pneumonia, according to many statements from India,¹ New Caledonia,² Nossi-Bé,³ Egypt and Nubia,⁴ Senegambia,⁵ the Soudan,⁶ the Gaboon,⁷ the West Indies,⁸ Mexico,⁹ Guiana,¹⁰ and Brazil;¹¹ and there are numerous proofs in the writings of United States physicians (Miller, Flint, Potter, Tidyman, Allen, Rodman and others), that it applies also to epidemics. I am unable to say how far this fact is to be explained on the ground of a predisposition (congenital or acquired) in the coloured races, particularly in the negro; or whether in their case also the wretched state in which they live, and their notorious carelessness in exposing themselves to the weather, may not be to some extent the decisive thing.

§ 48. INFECTIVE TYPE OF PNEUMONIA ("PNEUMO-TYPHUS,"
"TYPHOID PNEUMONIA").

The true *pathogenetic factor in fibrinous pneumonia* is a question that has exercised the mind of the profession of late to an unusual degree. The first point to be settled is the part played by influences of season and weather. It takes no ordinary amount of prepossession to set aside the facts and experiences given above, as being without any significance for the origin of the disease; or, in other words, to hold as irrelevant for the production of inflammation of the lungs, that disturbance of health which is usually known by the name of "chill."¹²

¹ Morehead, 'Clinical Researches,' ii, 304; McKay, l. c., account in 'Madras Monthly Journ. of Med. Sc.,' 1871, Feb., 133.

² de Rochas, Charlopin.

³ Deblenne.

⁴ Pruner, Hartmann.

⁵ Thaly, Borius, Berger, Hebert.

⁶ Balley.

⁷ Bestion.

⁸ Desportes, l. c., ii, 134; Carpentin, Mason, Moulin.

⁹ Heinemann, Vaillant.

¹⁰ Campet, l. c., 210.

¹¹ Sigaud, l. c., 129.

¹² As a specimen of the sort of logic by which the doctrine of chill as a cause

The only question is whether the influence of chill can of itself excite fibrinous pneumonia, as used to be freely assumed and is still asserted; or whether the effect of that upon the organism, and upon the respiratory organs in particular, is merely to predispose the individual towards taking the disease. Before we can answer that question, we must settle whether, from the etiological and clinical point of view, there is but one kind of fibrinous pneumonia, or whether the unity of the anatomical notion "fibrinous inflammation of the lungs" is represented always by a single clinical and etiological thing bearing the name of "pneumonia." Disregarding for a moment the views on that subject which recent studies of bacteria have led to (see p. 157), there can be, in my opinion, no question, after impartially weighing the facts before us, that fibrinous pneumonia may be the expression of morbid processes acknowledging different causes, the clinical types also varying within certain limits.

Medical writers in former centuries had with great justice recognised the fact that pneumonia, in many of its epidemic outbreaks that came under their observation, differed more or less from the ordinary sporadic inflammation of the lungs, not in origin merely, but in form also; at the same time the accounts of the morbid anatomy, although scanty, serve to prove that the disease corresponded to the definition of a fibrinous pneumonia. The malady was reckoned, accordingly, among diseases of a "pestilential" or a malignant and epidemical type; it was described as a "virulent" or "putrid" inflammation of the lungs, by which terms it was intended to signify the specific character of the disease, and to distinguish it from ordinary pneumonia.

of pneumonia is contested, we may take the argument of Kerschensteiner (l. c., p. 216) in his report on the epidemic of 1880 at the convict prison of Amberg, that chill as a cause of the disease was quite out of the question, for the reason that "the lowest temperature by no means corresponded to the largest number of cases, and *vice versa*"—as if chill were dependent on the absolute height or lowness of the thermometer. Other writers please themselves with the much-quoted experiment of Heidenhain ('Virchow's Archiv,' 1877, vol. 70, p. 443), who caused animals to inhale through a tube in the trachea both very hot and very cold air, and failed to produce fibrinous pneumonia thereby—as if that procedure had anything in common with what happens when one takes a chill. Although we are not well acquainted with the intimate processes of a chill, we may safely say at least that they are in the first instance an affair of functional disturbances, probably of the circulation and possibly also of the nervous system.

At a later period (beginning of the present century), when the term "typhoid" was getting introduced into general pathology in a new sense, the same type of pneumonia was described as "typhoid inflammation of the lungs," its peculiar symptoms coming under the notion of typhoid; or, again, it was viewed as the local outcome of a general infection set up by the "typhus-poison," and taken to be a "pneumotyphus;" or, finally, it was spoken of as an "adynamic" or "primary asthenic" inflammation of the lungs, the latter terms being chosen so as not to prejudice the question.

But, names apart, the writings of former times serve to prove, confirmed as they have been by recent observations, that there do occur inflammations of the lungs (especially in more or less considerable epidemics), which differ very decidedly in type from the ordinary sporadic pneumonia, although they do not depart from the anatomical character of that disease; and it is their occurrence in epidemics, sometimes within closely circumscribed and remote spots, that warrants us in concluding that we have here no mere modification of the type of disease caused by individual peculiarities, but that we are concerned with a *specifically infective cause of disease*, which imprints upon the malady a peculiar character. This conclusion finds support in the details already given of the circumstances under which these epidemics often occur, the circumstances, namely, that afford a specially favorable soil to infective diseases at large.

Among the epidemics of pneumonia which have spread over wide tracts of country, those of 1564 in Italy, Switzerland and Western Germany, of 1779 in Italy, of 1783-85 in France, of 1812-25 and of 1863-75 in the United States, and of 1857 in Bolivia, Peru and Western Brazil, hold the first place. Epidemics in garrisons or barracks are reported by Ekelund for Stockholm in 1824, by Ulrich for Sommerfeld in 1845, by Masselot for Versailles in 1847, by Worms for St. Cloud in 1865, by Welch for New Brunswick in 1866, by Costello and Giles for various military stations of the Punjab in 1875 and 1882, by Köhnhorn and Kranz for the garrison of Wesel in 1875, by Knoevenagel for Cologne in 1879 and Schwerin in 1882, and by Janssen for the Helder garrison in 1883. Among the crews of ships-of-war, epi-

demics of that sort were seen in 1779 in the Danish fleet at anchor in the harbour of Copenhagen (Callisen), and in 1860 on board some of the ships of the English Mediterranean fleet (Bryson). Of epidemics in prisons and penitentiaries we have accounts for Christiania in 1847 and 1866 (Dahl), for Frankfort, Kentucky, in 1875 (Rodman), for Moringen from 1875 to 1878 (Kühn), for Midnapore in 1844 (Green), and for Amberg in 1880 (Kerchensteiner). We may include here the epidemic of 1824 and 1825 in the deaf-and-dumb institution of Philadelphia (Wood). Small epidemics that kept within the limits of one house or one family are reported from various parts of Britain by Grimshaw and Moore, Waterfield, Daly, Jelley, Patchett, Raven, and others; from Eidsvold in Norway by Thoresen, from Liebenzell in Würtemberg by Schroter, from Gunzenhausen by Müller, from Uster in Switzerland by Ritter, from Leipzig by Heitsch, and from Berlin by Senator.¹

Clinical and Anatomical Characters of Epidemic Pneumonia.—It would carry me beyond the limits of the task assumed in this work if I were to attempt a detailed description of the clinical and anatomical characters of the pneumonia of these epidemics. Referring the reader to writings dealing fully with the subject, particularly to those of Ritter and Wagner,² I content myself here with a brief summary of the most important clinical and anatomical phenomena which distinguish this infective form of pneumonia from the ordinary inflammation of the lungs; I must premise, however, that these have been by no means uniform in all epidemics or in all individual cases, a circumstance that may perhaps be explained, apart from the varieties of constitution in individual persons, by differences of kind in the specific disease-producing cause.

Among the most characteristic and most uniform of the phenomena in this form of disease is an unusually long prodromal stage, not like that of ordinary pneumonia, but such as may be observed in other infective diseases, the signs of the local affection (dulness, crepitation, &c.) being late in showing themselves, often as late as four to six days from the initial rigor. The morbid process is limited unusually often to the upper lobe, complicated with fibrinous or suppurative pleurisy, with an unusual degree of weakness, and almost constantly with the cerebral or nervous phenomena (headache, stupor, delirium) constituting the typhoid state. Usually there are gastric symptoms, not unfrequently diarrhœa and icterus. In many cases the fatal issue is rapid, four or

¹ 'Charité-Annalen,' 1885, x, 324.

² 'Archiv für klin. Med.,' xxxv, 1884, p. 191.

five days from the commencement of the illness; or the course may be protracted and severe, without a decided crisis. *Post mortem* the fibrinous exudation may be in lobular spots only, being often remarkably soft and occasionally hæmorrhagic (corresponding to the dark reddish-brown sputa); not unfrequently grey hepatisation will have come on rapidly, or purulent infiltration to the extent of liquefaction of the tissues. The spleen is almost always swollen, sometimes also the liver; and there may be an affection of the kidneys, in which case albuminuria would have been observed during life. The mortality is very high.

§ 48. EVIDENCE OF CONTAGIOUS TRANSMISSION.

Further evidence of the infective character of certain forms of pneumonia may be found in *the transmission of the disease* by contagion from person to person, as made out, or at least conjectured, by various observers. As early as the seventeenth century, the question of communicability in epidemics of pneumonia was raised and debated by Italian writers, having been answered by Colle in the negative on the strength of his Urbino experiences in 1602. I can find no indications of it in the medical writings on epidemic pneumonia belonging to the eighteenth century; while several of the authorities on the United States epidemics in the early part of the present century declare that there are no proofs of the malady being contagious. Schroter was the first to pronounce (but not without reserve) in favour of the communicability of inflammation of the lungs, on the strength of observations that he had made in a small group of cases: "The contagion," he says, "if one may speak of contagion at all, would appear to be of an extremely feeble kind. . . . its vehicle is the air expired by the patient." More definite opinions in favour of contagiousness have been expressed by Penkert, Thoresen, Butry, Bruce, Patchett, Riesell, Blyth, Massalongo, Kaurin, Bryson (who states that the disease was introduced into the hospital of Malta from English ships-of-war), Jelley, Kühn, Targioni, Costello, and Giles. Other observers, including Knoevenagel, Senft, Zweifel, and Daly, are unable to come to a decision, the last named remarking that in the cases under his own observation, which might seem to favour the idea of a contagious

diffusion of the disease, there may have been nothing more than a continuous succession of infections from one and the same exterior source. Lastly Ritter, Holmsen, Kerschens-
steiner, Heitsch and others have found nothing in their experience to convince them that the disease may be transmitted. These discrepancies in the results of observation may perchance be reconciled at a future time, on the hypothesis already suggested, that several morbid processes differing in their causation are included under the common name of "infective pneumonia."

§ 49. THE SEARCH FOR MICROBES.

The opinion which has come to be generally adopted, that fibrinous pneumonia depends upon an infective morbid process, finds additional support in the discovery of a *micro-parasite* in the diseased tissues; although the evidence on that subject cannot be considered as conclusive, so long as neither the nature of the parasite is made out with absolute certainty, nor its relation to the diseased process, nor, indeed, the uniform presence of a specific parasite in fibrinous pneumonia established beyond all question. The earliest inquiries on the subject were those of Klebs¹ and Eberth.² After these came a series of investigations, conducted according to Koch's bacteriological method, by Friedländer,³ Leyden,⁴ Ziehl,⁵ Matray,⁶ Guffini and Cambria,⁷ Giles,⁸ Salvioli and Zoeslein,⁹ and Talamon,¹⁰ all of which, although they differ in minor points, are on the whole in agreement as to the form, grouping and other characteristic features of the parasite. Of these writers, Ziehl, Giles and Salvioli have

¹ 'Archiv für experimentelle Pathol.,' 1875, iv, 20.

² 'Archiv für klin. Med.,' 1880, xxviii, 1.

³ In 'Virchow's Arch.,' 1882, Bd. 87, 319; and 'Fortschritte der Medicin,' 1883, Nr. 22.

⁴ 'Zeitschr. für klin. Med.,' 1883, vi, 267.

⁵ 'Centralbl. für die med. Wissensch.,' 1883, Nr. 25.

⁶ 'Wien. med. Presse,' 1883, 732, 766.

⁷ 'Giornale internazionale delle sc. med.,' 1883, iv, Fasc. 5, 6.

⁸ *l. c.*

⁹ 'Centralbl. für die med. Wissensch.,' 1883, Nr. 41.

¹⁰ 'Progrès med.,' 1883, Nr. 51, 1030.

succeeded in producing fibrinous pneumonia in animals (rabbits and rats) by infecting them with cultivated "pneumonia-cocci." On the other side, Wagner states that he has "not succeeded as yet [August, 1884] in advancing a single step towards solving the question of the unity or multiplicity of pneumonia, and that he has found the cocci in cases which had clinically nothing whatsoever in common with primary croupous pneumonia." Klein¹ also throws doubt on the causal connexion between fibrinous infiltration of the lungs and the micrococci discovered by the writers mentioned above; and he points out that it was not pneumonia but septicæmic processes which he observed to follow in mice and rabbits when he infected them with the suspected parasites.

But the question has reached an entirely new phase through the inquiries of Afanassiew and Cornil,² and of Lumbrosa.³ Afanassiew's conclusions, from his studies and inoculation-experiments on rats, dogs and guinea-pigs, are as follows: (1) micrococci always play an active part in the production of fibrinous pneumonia; (2) it is probable that various closely allied species of microbes are concerned, differing from one another in form and size; (3) the pathogenic properties of the cocci of pneumonia are not very great inasmuch as certain animals not only show resistance to them, but also recover when infection has taken place; (4) the effect of the micrococci in setting up disease is most decided when they are introduced directly into the lungs; (5) whatever lessens the resistance of the individual, such as a chill, or an attack of exanthematous fever, favours the development of micrococci in the organism, and consequently the setting up of pneumonia itself. In a supplement to Afanassiew's paper Cornil states that he has found the same micrococci in pneumonias secondary to typhoid fever, in measles, and in pulmonary consumption; he is of opinion, accordingly, that the debilitated condition induced by these diseases is a necessary antecedent to the setting up of pneumonia by the agency of parasites. Replying to the comment of Brown-

¹ 'Centralbl. für die med. Wissensch.,' 1884, No. 30.

² 'Gaz. des hôpit.,' No. 66, 1884, p. 523.

³ 'Progrès méd.,' Nos. 41 and 42, pp. 813, 831.

Séguard, that he had induced pneumonia by injuring certain parts of the nervous system, Cornil says that this does not happen always, whereas inoculation with micrococci obtained by pure cultivation is followed by pneumonia in every case. Lumbrosa, having made an inquiry, at Cornil's instigation, into the occurrence of the so-called cocci of pneumonia in other diseases, reports that he has found them in the inter-current broncho-pneumonia of measles, diphtheria and croup, the form being exactly the same as in fibrinous pneumonia; but that he had never found along with them other micrococci distinctive of these primary diseases. His experiments to infect guinea-pigs had never led to any result.

§ 50. SUMMARY AND MISCELLANEA ("MALARIAL PNEUMONIA").

The following are the conclusions on the *pathogenesis* of pneumonia that may be drawn from the facts and reasoning of this chapter, relating as they do to the circumstances which stand, or at least seem to stand, in more or less close relation to the occurrence and diffusion of fibrinous pneumonia:

(1) *It is not proved that fibrinous pneumonia always depends upon infection.* Not to mention the class of facts adduced to show that traumatic excitation¹ (acting either physically or chemically) can induce those very anatomical changes in the lungs that are proper to pneumonia, we have so far found no sufficient reason to strike out the pneumonia due to chill from the list of diseases. There can be few experienced practitioners who have not had over and over again cases of inflammation of the lungs which they were

¹ I may recall here the interesting paper of Litten ('Zeitschr. für klin. Med.,' 1881, v, 26) on "Contusions-pneumonie," with the further remark that Flint had already mentioned these traumatic pneumonias ('Amer. Journ. of Med. Sc.,' 1861, Jan., p. 23). In a criminal trial at which I acted as an expert assessor, the question related to a fibrinous pneumonia, diagnosed as such by a thoroughly competent practitioner; it had occurred in a man immediately after receiving a number of severe blows on the chest, and without any breakage of ribs. Sommerrodt ('Virchow's Archiv,' 1872, vol. 55, p. 153) has found spots of croupous pneumonia in the lungs of dogs which had had a weak solution of liquor ferri perchloridi injected into the trachea. Veraguth (ib., 1880, vol. 82, p. 238) found that the same thing happened when he injected a weak solution of nitrate of silver.

constrained to refer to the influence of chill, having as much certitude as was attainable under the circumstances, and not having the smallest reason to ascribe their origin to an infective cause. There is much truth in what was lately said by a clinical physician of solid repute during a discussion on the question: that if we were for the moment disposed to give up chill as an etiological factor in fibrinous inflammation of the lungs, we shall soon have to come back to it.

(2) *There can be no doubt of the occurrence of infective forms of pneumonia.* In evidence hereof we have not only the fibrinous inflammations of the lungs that appear intercurrently in many infective diseases (influenza, measles, typhoid, cholera), and are very often indistinguishable, whether clinically or anatomically, from genuine pneumonia; but more especially we have the epidemics of pneumonia spoken of at length in the foregoing pages, in which the infective character of the process is obvious from every point of view.

(3) *We are unable for the present to give a certain opinion on the nature of the infecting substance.* That in many cases it is of a parasitic nature is made highly probable by the inquiries above mentioned. But there is always the question whether the parasite is the cause of the morbid affection in the pulmonary tissues, or whether it develops therein after the illness has begun; the experiments made upon animals with a view to settle that point have not as yet yielded decisive results; and the solution would be more remote than ever if there should be any confirmation of the observations of Afanassiew, Cornil, and Lumbrosa that the same micrococci as in fibrinous pneumonia are found in broncho-pneumonia also.

(4) *The conjecture that the primary infective pneumonias owe their origin to a variety of infecting matters, or, in other words, that there are forms of infective pneumonia differing in their ætiology, cannot be summarily dismissed.* No doubt there is a want of trustworthy evidence; but such evidence can only be found in the definite discovery at length of the specific morbid cause.¹

¹ The observations of Ritter and of Wagner (ll. cc., p. 193, and p. 213-4, on

(5) *It has not been proved that the virulent matter underlying typhoid fever may so affect the organism as to spare the intestinal follicles and set up primary inflammation of the lungs; or, in other words, there is no proof of a true pneumo-typhus.* The doctrine of pneumo-typhus appears to me to owe its existence to an abuse of the word "typhus." In its historical development, as we have seen, it denoted, along with "typhoid" (typhös), merely the kind of type in various acute diseases, including pneumonia; the particular type being marked by the intercurrent of so-called "nervous" or "typhoid" symptoms. Subsequently, however, writers discovered in that group of symptoms the characteristic mark of a nosological species, which received the name of "typhus." It presented itself under a variety of forms or modifications; and just as they spoke of an Eastern typhus (bubo-plague), of a "garrotillo"-typhus (diphtheria), of typhus "amarillo" (yellow fever), and of typhus cerebialis (epidemic cerebro-spinal meningitis), so also they spoke of a pneumo-typhus. Before concluding from the occurrence of inflammation of the lungs side by side with typhoid, that such a form of pneumonia does really exist, we should bear in mind that, at other times, pneumonia has been epidemic along with spotted typhus, or with diphtheria (as in Schwerin so recently as 1882), or scurvy, or meningitis (particularly in the United States). The co-existence of pneumonia with these infective diseases does not warrant us in concluding for a genetic relationship between them, any more than does the often-observed coincidence of epidemics of measles with the epidemics of whooping-cough justify the same conclusion in their case.

(6) *The existence of "malarial pneumonia," or of a fibrinous inflammation of the lungs directly due to the malarial poison appears to me to be doubtful, to say the least. The writings on the subject,¹ which come without exception from*

house-epidemics of pneumonia are interesting in this respect; they lead one to think that the infection had proceeded from animals (fowls and dogs).

¹ Among the more noteworthy of them I may mention those by Salvagnoli Marchetti ('Saggio illustr. le tavole della statistica med. delle Maremme, &c.,' ii, 44), for the Tuscan Maremme; also for Algiers by Catteloup ('Mém. de med. milit.,' 1853, ii, sér. xi, 268), and Frison (ib., 1866, iii, sér. xvii, 97); for the United States by Drake ('Treat. on the Principal Diseases of the Interior

centres of intense malaria, lead me to the conclusion that we have to do here with a variety of conditions. In not a few of the cases, there had been a combination of malarial fever and pneumonia, which had run their course either simultaneously in the patient or the one in close succession upon the other, modifying each other in the matter of symptoms, and, in the event of death, discovering the anatomical changes proper to each. The *post-mortem* conditions reported by Catteloup and Frison from Algiers belonged undoubtedly to such cases: "À l'autopsie on rencontre, indépendamment des altérations organiques dues à la cachexie marématique . . . les lésions caractéristiques de l'hépatisation rouge, ou celles de la splénisation, ou enfin celles de l'hépatisation grise, étendues à tout un lobe, à tout un poumon et le plus souvent même aux deux poumons."

Another group is made up of those cases where pneumonia occurs in persons who have suffered from malarial fever for a long time or have developed the malarial cachexia; these are cases (forming the majority of those referred to in the papers by United States practitioners), which run their course for the most part with severe symptoms and are often fatal. Lastly, we have to place in a third group those congested states of the lungs incidental to the malarial paroxysms, which either remain over as a sequela of the paroxysms or may reach such a height during the progress of the disease that the patient will die of respiratory and circulatory troubles; these are the cases that deserve most of all the name of "*febris perniciosa pneumonica*," for the reason that the pulmonary affection is in fact a result of the action of

Valley of North America, &c.' sec. ser., Philad., 1854, 868) relating to the southern part of the Mississippi Valley; by Watkins ('Transact. of the State Med. Soc. of New York,' 1859) for Sullivan Ct. (N. Y.); by Potter ('Baltimore Med. and Surg. Journ.,' 1834, Jan.) for Baltimore; by Manson ('Transact. of the State Med. Soc. of North Carolina,' 1857), and Howard ('North Carol. Med. Journ.,' 1859, Oct., 1860, Jan., March), for North Carolina; by Gibbs ('South. Med. Reports,' 1850, ii, 190), for De Soto (Louis.); by Coolidge ('Med. Statist. Reports of the U. S. Army,' 1859, 269), for Arkansas; by Barnes (ib., 163), for Fort Scott (Kans.); by Glisan (ib., 276), for Fort Arbuckle, Ind. Terr.; and lastly by Cornibert ('Essai sur la fièvre pernicienne pneumonique observée au Brésil,' Par., 1872), and by Rey ('Arch. de méd. nav.,' 1877, Janv., 25), for the East Coast of Brazil.

the malarial poison, although it does not amount to fibrinous pneumonia.

This is the conclusion come to by Cornibert from his own observations on the Brazilian coast and from a critical examination of numerous papers on the subject by French practitioners: "Il n'existe pas d'exemples avérés de pneumonie intermittente; la plupart des affections décrites sous ce nom ont été confondues avec des congestions pulmonaires; il existe une forme de fièvre intermittente accompagnée de symptômes graves de congestion pulmonaire, on peut la désigner sous le nom de fièvre pernicieuse pneumonique." This opinion is supported also by the essay of Dumeige,¹ which deals with a series of cases of that kind observed at Amiens. Special importance attaches to the details of the morbid anatomy given by Salvagnoli Marchetti for a number of patients who have died of that form of fever in the Tuscan Maremma.

The state of matters induced by the miasmatic intoxication leads very easily to excitation and hyperæmia, but not often to true inflammation, in those organs which are most subject to chill. It is somewhat usual, therefore, for a condition of passive congestion or stasis to arise in the lungs, which we try in vain to get rid of by abstraction of blood; an exclusively antiphlogistic treatment, if consolidation of the lung has been diagnosed from the dulness on percussion and the absence of vesicular murmur, is precisely the treatment to conduct the patient in most cases to his death. When the *post-mortem* examination is made, we conclude that the diagnosis is confirmed when the lung sinks in water; but if we cut into its substance, we shall find that it has neither the resistance nor the look of a hepatised lung. What we find is blood flowing from the air-cells as from a sponge, and the more copiously the firmer the piece of lung is pressed in the hand; when the tissue has been thus emptied of its blood, it now floats in water, thus proving that the morbid condition had consisted of no more profound affection of the lung than a hyperæmia.

¹ 'De la congestion pulmonaire d'origine paludéenne,' Paris, 1880.

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CHAPTER VII.

PULMONARY CONSUMPTION.

§ 51. A DISEASE OF ALL TIMES AND COUNTRIES.

Consumption of the lungs may be traced with certainty in the writings of every period¹ as far back as the earliest attempts of the ancient world to deal with medicine according to a method. History does not inform us, however, of the extent to which the malady had been prevalent during former times in various parts of the world; and it must remain undecided whether there has been as a matter of fact any increase in the number of cases *pari parsu* with the progress of civilisation and its inevitable consequences, such as has been often alleged and is indeed rendered probable in a measure by the experiences to be related in the sequel. But there can be no question that pulmonary consumption has held at all times and among all civilised peoples a foremost place among the national diseases. In our own age, at all events, it occupies one of the leading positions in the statistics of mortality. Taking the mean death-rate of the whole of a population to be 22 per 1000, and the average of deaths from phthisis of the lungs to be 3 per 1000, we find that the deaths from consumption are nearly one-seventh of the whole mortality (or in the ratio of 3 to 22).

¹ Compare the excellent account by Waldenburg in his treatise 'Die Tuberculose, die Lungenschwindsucht und die Scrophulose,' Berlin, 1869, pp. 1—130.

§ 52. RELATIVE FREQUENCY IN VARIOUS PARTS OF THE WORLD.

Corresponding to the prevalence of consumption at all times is the universality of its *geographical distribution* at present. It extends over every part of the habitable globe; it may be designated an ubiquitous disease in the strictest meaning of the term. To prepare the way for an account of that distribution I give here a tabular survey of the death-rate from consumption at a considerable number of places both in the Eastern and in the Western Hemisphere,¹ which will suggest a number of points of view and furnish us with many data of interest for the etiological inquiry.

Table of Death-rates from Pulmonary Consumption.

Locality. ²	Period.	Deaths per 1000 in- habitants.	Authority.
NORWAY { Christiania {	1854-67 1871-75 1866-75	2.21 2.53 3.45	{ Homann, 'Norsk Mag. for Læge- vidensk.,' 1865, p. 857; Larsen, ib., 1870, p. 1; Lund, ib., 1875, p. 523; Dahl, ib., 1879, pp. 281, 417.
SWEDEN..... Stockholm Falun	1861-76 " 1861-65	3.5 4.1 3.0	{ Devertie, 'Eira,' 1879, pp. 6, 34. Hallin, 'Svensk. Läk. Sällsk. N. Hdl.,' ser. ii, Decl. ii, p. 237.
DENMARK.			
Copenhagen..... 5 largest towns . 24 medium towns 25 smallest towns	1876-83 " " "	3.0 2.63 2.27 2.12	{ Lehmann, 'Viertelj. für öffentl. Gesundheitspf.,' 1882, xiv, p. 570; Hospitalstidende 1884 (German transl. in 'Ergänzungsheft zum Centralbl. für allgem. Gesund- heitspf.,' 1884).

¹ It need hardly be explained that the results of these statistical calculations are not to be accepted without a reserve which will vary in its degree according to circumstances. Thus the numerical averages which apply to the more considerable tracts of country are much inferior in trustworthiness to those calculated for smaller areas, such as individual towns.

This table does not include any towns with a population under 15,000.

Locality.	Period.	Deaths per 1000 in- habitants.	Authority.
GERMANY.			
Towns with over 15,000 pop.	1877-80	3.6	Schlockow, 'Zeitschr. des preuss. statist. Bureaus,' 1883, xxiii, p. 245. From the reports of the Public Health Office.
<i>N.-east coast and German plain.</i>			
Königsberg.....	1877-80	2.8	} Schlockow, l. c.
Danzig.....	"	2.5	
Stettin.....	"	2.6	
Lübeck.....	"	2.6	
Kiel.....	"	2.9	
Posen.....	"	3.0	} Jacobi, 'Beitr. zur med. Klimatolog- und Statistik,' Bresl., 1879.
Breslau.....	1869-78	3.7	
Frankfurt - on - the-Oder.....	1877-80	3.5	Schlockow, l. c.
Berlin.....	1869-82	3.8	'Statist. Jahrb. der Stadt Berlin.'
Magdeburg.....	1877-80	3.8	} Schlockow, l. c.
Halle.....	"	2.7	
Leipzig.....	"	3.5	
<i>N.-west coast and German plain.</i>			
Hamburg.....	1871-83	3.4	'Bericht des Medicinalinspectors über die med. Statistik des Staates von Hamburg.'
Altona.....	1877-80	3.8	} Schlockow, l. c.
Bremen.....	"	3.2	
Brunswick.....	1864-73	4.0	Blasius, 'Verbreitung, Actiologie, &c., der Schwindsucht.'
Hanover.....	1877-80	4.3	} Schlockow, l. c.
	"	3.8	
<i>Central & southern hill country.</i>			
Dresden.....	1877-80	3.8	Schlockow.
Chemnitz.....	1870-74	2.9	} Flinzer, 'Mitth. des stat. Bureaus der Stadt Chemnitz.'
	1877-80	2.9	
Erfurt.....	"	3.3	} Schlockow.
Gotha.....	"	2.5	
Cassel.....	"	3.7	
Würzburg.....	1871-79	5.2	Hofmann, 'Verhandl. der Würzb. phys.-med. Gesellsch.'
Nürnberg.....	1877-80	4.9	} Schlockow.
Augsburg.....	"	3.9	
Münich.....	"	4.0	
Stuttgart.....	1873-82	2.8	'Bericht. med.-stat., über die Stadt Stuttgart vom Jahr 1883,' 1884.

Locality.	Period.	Deaths per 1000 in- habitants.	Authority.
<i>Plain of the Upper Rhine.</i>			
Frankfurt	1863-83	3.5	'Ueber den Civilstand der Stadt Frankfurt.'
Wiesbaden	1877-80	4.0	
Mainz	"	3.9	Schlockow.
Darmstadt	"	3.7	
Mannheim	"	4.0	
Karlsruhe	"	3.8	
Strassburg	"	3.5	
Metz	1850-60	2.9	Saunois, 'Hist. de la phthisie pulm. à Metz.'
	1877-80	3.5	Schlockow.
<i>Plain of the Lower Rhine.</i>			
Dortmund	1877-80	4.7	Schlockow.
Bochum	"	5.7	
Hagen	"	6.3	
Crefeld	"	5.8	
Düsseldorf	"	3.5	
Elberfeld	"	4.0	
Barmen	"	4.5	
Remscheid	"	8.8	
München - Glad- bach	"	7.3	
Cologne	"	4.4	
Bonn	1867-82	3.5	Schmitz, 'Ueber den Einfluss des Geschlechtes u. s. w. auf die Schwindsuchtssterblichkeit, &c.,' Bonn, 1884.
Coblenz	1877-80	4.3	Schlockow.
Aix la Chapelle ..	"	3.8	
Treves	"	4.7	
AUSTRIA.			
Prague	1865-74	8.5(P)	Körösi, 'Statist. internat. des grandes villes,' Budapesth, 1876.
Brünn	1873-74	9.9(P)	'Statistik des Sanitätswesens der im Reichsrathe vertretenen Königreiche, &c.,' Wien, 1877, 1878.
Linz	"	8.9(P)	
Vienna	1865-74	7.7	Körösi.
Trieste	1870-74	4.5	
Pesth	1872-75	6.9	
ENGLAND	1848-55	3.0	Annual Reports of the Registrar-General.
	1859-69	2.5	
	1872-76	2.2	
	1848-55	3.7	
London	1859-69	3.2	

Locality.	Period.	Deaths per 1000 in- habitants.	Authority.
South-eastern counties	1848-55 1859-69	2.7 2.6	Annual Reports of the Registrar- General.
Southern in- land counties	1848-55 1859-69	2.6 2.3	
Eastern coun- ties	1848-55 1859-69	2.7 2.4	
South-western counties	1848-55 1859-69	2.3 2.2	
Western in- land counties	1848-55 1859-69	2.7 2.2	
Northern in- land counties	1848-55 1859-69	2.7 2.4	
North-western counties	1848-55 1859-69	3.7 3.2	
Yorkshire ...	1848-55 1859-69	2.9 2.8	
Northern counties	1848-55 1859-69	2.5 2.7	
Wales	1848-55 1859-69	3.3 3.1	
SCOTLAND.			'Seventh Annual Report of the Registrar-General for Scotland,' pp. xlvii, xlviii.
Edinburgh	1857-61	3.0	
Leith	"	2.0	
Glasgow	"	4.0	
Dundee	"	3.4	Meyne, 'Topogr. méd. de la Bel- gique,' Brux., 1865, p. 487. Bertillon, 'Annal. d'hyg.,' 1862, xviii. Janssens, 'Bullet. de l'Acad. de méd. de Belgique.' Körösi, l. c.
BELGIUM	1851-55	3.5	
Brussels	1856-59 1864-78	4.1 5.6	
Liege	1865-74	4.0	
Antwerp	1868-74	3.3	
HOLLAND	1869-74	2.46	Droeze, 'De sterfte van phthisis in Nederland,' Leid., 1879.
North Brabant...	"	2.45	
Herzogenbusch	"	2.86	
Breda	"	3.34	
Gelders	"	2.49	
Arnhem	"	2.80	
Nymwegen ...	"	2.47	
South Holland...	"	2.28	
Gravenhaag ...	"	2.43	
Delft	"	2.70	
Leyden	"	2.65	
Rotterdam	"	2.79	
Gouda	"	2.29	
Dordrecht	"	2.24	

Locality.	Period.	Deaths per 1000 in. habitants.	Authority.
<i>North Holland</i> ...	1869-74	2'38	Droeze, 'De sterfte van phthisis in Nederland,' Leid., 1879.
Amsterdam ...	"	2'53	
Alkmaar.....	"	2'98	
Haarlem.....	"	3'04	
<i>Seeland</i>	"	1'87	
Middelburg ...	"	2'42	
Utrecht	"	2'62	
Utrecht	"	3'23	
<i>Friesland</i>	"	2'51	
Leuwarden ...	"	2'70	
<i>Overysse</i>	"	3'27	
Zwolle.....	"	3'37	
Deventer	"	3'63	
<i>Groningen</i>	"	2'38	
Groningen.....	"	2'78	
<i>Drenthe</i>	"	3'09	
<i>Limburg</i>	"	2'33	
Mastricht	"	2'90	
SWITZERLAND ...	1865-69	1'86	Müller, 'Die Verbreitung der Lungenschwindsucht in der Schweiz,' Winterthur, 1876.
Zürich	"	2'4	
Winterthur.....	"	2'5	
Chur.....	"	3'0	
Bern	"	3'9	
Geneva.....	"	2'2	
FRANCE.			Bertillon, l. c. 'Bulletin récapitulatif pour l'année 1877,' Par., 1878.
Paris.....	{ 1845-51 1872-77	{ 4'1 4'2	
ITALY.			Sormani, 'Geogr. nosol. dell' Italia,' Roma, 1881, 149 ff.
Venice	{ 1862-85 1875-78	{ 4'04 3'73	
Padua	{ 1862-65 1872-77	{ 3'27 2'80	
Verona.....	{ 1853-57 1874-78	{ 2'19 2'02	
Milan	{ 1861-70 1875-78	{ 3'69 3'82	
Turin	{ 1855-67 1869-76	{ 2'39 2'73	
Genoa	1875-78	2'00	
Bologna	"	3'84	
Rome	1874-78	3'42	
Naples	1875-78	2'75	
Palermo	1873-78	2'64	
Messina	1876-78	3'02	
Catania	1877-78	1'42	

Locality.	Period.	Deaths per 1000 in- habitants.	Authority.
MALTA	1822-34	3.3	Tulloch, 'Statist. Reports of the Brit. Army,' Lond., 1839.
EAST INDIES. Native troops ...	1850-60	3.0	Carsten, 'Congrès internat. de médecins de colonies, Amsterdam, 1883,' Amst., 1884, p. 243.
AUSTRALIA. Melbourne	1865-70	2.22	Thomson, 'On the Supposed Influence of Climate on Phthisis, &c.,' Melbourne, 1871.
ST. HELENA	6 years	2.2	Tulloch, 'Reports,' 1840.
ALGIERS	1852-59	2.9	Pietra Santa, 'Annal. d'hyg.,' 1860, Janv., seq.
UNITED STATES.			
Boston, Mass. {	1811-40	3.8	} Shattuck, 'Amer. Journ. of Med. Sc.,' 1841, Apr., p. 369.
	1865-70	3.3	
	1846-48	3.8	
Lowell, Mass. {	1870	4.1	} Curtis, 'Transact. of the Amer. Med. Assoc.,' ii, 487.
Newburyport, Mass.	1856-82	3.4	Gleitsmann, 'Statistics of Mortality from Pulmonary Phthisis in the U.S.,' Baltimore, 1875.
Providence, R.I.	1870	2.3	Hurd, 'Boston Med. and Surg. Journ.,' 1883, March, ff.
New Haven, Conn.	"	2.97	} Gleitsmann.
New York ... {	1805-37	5.3	
	1870	4.1	} Dunnel, 'Amer. Journ. of Med. Sc.,' 1838, May, p. 237.
Brooklyn, N.Y. .	"	3.2	
Albany, N.Y. ...	"	2.9	} Gleitsmann.
Buffalo, N.Y. ...	"	1.4	
Philadelphia, {	1807-40	5.6	} Emerson, 'Amer. Journ. of Med. Sc.,' 1827, Nov.; 1831, Nov.; 1848, July.
Pa.	1870	3.1	
Pittsburg, Pa. ...	"	2.5	} Gleitsmann.
Cincinnati, Ohio	"	2.7	
Cleveland, Ohio.	"	1.6	
Chicago, Ill.	"	1.6	
Baltimore, {	1819-26	4.1	} Niles and Russ, 'Med. Statistics, &c.,' New York, 1827.
	1836-54	4.0	
Md.	1870	3.7	
Norfolk, Va.	"	3.5	} Joynes, 'Amer. Journ. of Med. Sc.,' 1850, Oct.; Frick, ib., 1855, Oct.
Richmond, Va. ...	"	3.9	
Louisville, Ky. ...	"	2.2	} Gleitsmann.
St. Louis, Mo.	"	1.7	
Willmington, N.C.	1880	1.9	Wood, 'North Carolina Med. Journ.,' 1883, March.

Locality.	Period.	Deaths per 1000 in- habitants.	Authority.
Charleston	1870	3.9	} Drake, 'Treatise,' ii, 885.
Whites		3.7	
Negroes		4.0	
Mobile, Ala.	1870	4.15	} Gleitsmann.
Montgomery, Ala.	"	3.53	
Memphis, Tenn. ..	"	2.82	
New Orleans, La. ..	1869-79	3.9	Elliot, 'Bost. Med. and Surg. Journ.,' 1883, March, ff.
Salt Lake City, Ut.	1870	1.08	Gleitsmann.
San Francisco ...	1870-74	2.97	Körösi.
BRAZIL.			
Pernambuco		5.2	Béringer, 'Arch. de méd. nav.,' 1879, Mars, p. 221.
Rio de Janeiro ...	1855-58	5.0	Rey, 'Annal d'hyg. publ.,' 1878, Septbr., p. 215.
Desterro, S. Catarina ...	1862	3.9	Rey, ib., 1877, Janv. 1.
URUGUAY.			
Montevideo ... {	1871 1874-75	} 4.0	Féris, ib., 1879, Oct., p. 254.

Although these statistical data should not be credited, as we have seen, with more than a limited value, yet they supply incontrovertible evidence that there are differences in the frequency of consumption, sometimes even very considerable differences, in the various divisions of a country and even at various points within a small area; and that is a conclusion which is fully borne out by information come by in other ways as to the amount of the disease in different parts of the world.

A very remarkable fact in the geographical distribution of consumption on *European soil* is its rarity in many of the islands and coast districts within the more northern latitudes, such as *Iceland*, the *Faröe Islands*, the *Hebrides*, the *Shetland Islands*, and places in *Norway*.

Schleisner,¹ writing of *Iceland*, says: "According to the unanimous testimony of practitioners in the island, consump-

¹ 'Island undersøgt, &c.,' Kjöbenh., 1849, p. 3.

tion does indeed occur there, although remarkably seldom. In my own practice I have most carefully examined every patient who complained of even the slightest trouble in the chest, and out of 327 persons suffering from chronic diseases of the organs of respiration, I found only 3 with phthisis, one of these being a person of Danish extraction." That statement is borne out in the more recent writings on the state of health in Iceland by Leared,¹ Hjaltelin,² and Finsen.³ It would appear that it is not with any national peculiarity that we have here to do, from the fact that Icelanders who migrate to Denmark fall into consumption not unfrequently.

To the same effect is the information given by Manicus⁴ and Panum⁵ for the *Farøe Islands*; among 100 patients examined by the latter, there were only two with phthisis. In the *Hebrides* the disease is almost unknown;⁶ in the *Shetland Islands* it is said to have been not at all common until recent years.⁷ With reference to Norway, Martin⁸ wrote some time ago: "Tous les médecins de la Scandinavie sont d'accord pour affirmer que cette maladie [phthisis] devient d'autant moins commune, qu'on s'avance vers le nord;" and that statement is confirmed by the statistical researches of Homann for 1858-63 (referred to in the table), from which it follows that the smallest number of deaths from consumption in the whole of Norway (7.9 to 9.2 per cent. of the mortality from all causes) falls in the northern provinces (Finmark, Nordland, Trondjem, Romsdal, Bergen), and the largest number (15 to 22 per cent) in the southern (Stavanger, Lister and Mandal, Nedenäs, Bratsberg, Jarlsberg, Smaalenene and Christiania). Lund and Dahl come to nearly the same conclusion from the statistics of mortality in 1866-71 and 1872-76.

Consumption appears to be more common in *Sweden* than in Norway. From the statistics for the years 1861-70 and

¹ 'Brit. Med. Journ.,' 1869, Jan., p. 61.

² *Ib.*, Aug., p. 255.

³ 'Sygdomsforholdene i Island,' Kjöbenhavn, 1874, p. 87. *

⁴ 'Bibl. for Læger,' 1824, p. 15.

⁵ *Ib.*, 1847, i, 277.

⁶ Mac Cormac, 'Brit. Med. Journ.,' 1868, Nov., p. 571; McNab, *ib.*, 1869; May, p. 404; Smith, 'Edin. Med. Journ.,' 1873, Jan., p. 607.

⁷ Sexby in 'Dobell's Reports,' 1871, p. 522.

⁸ 'Notes méd. rec. pendant un voyage en Norvège, &c,' Paris, 1844, p. 21.

1875-76, Devertie draws the conclusion that the disease is most frequent in the Mälar Valley and on the East Coast (with the exception of Westernorrland), that it decreases on the South Coast from Blekinge and Schonen downwards, increases again on the West Coast without becoming so common as on the East Coast, that in the interior Dalarne is most affected with it and Jämtland least, the frequency diminishing as we proceed southwards from Dalarne. As a general rule consumption is more prevalent in the southern than in the northern regions of Sweden, although the difference is not so great as in Norway.

In the islands and mainland of *Denmark* the disease stands at about the mean average of frequency, according to the result of Lehmann's inquiries. The same appears to hold good for the northern governments of *Russia in Europe*, although the very meagre and somewhat vague information from that country does not enable us to come to any conclusion with certainty. In St. Petersburg¹ the disease is not more frequent, at all events, than in the average of large European cities; in Finland and the Baltic Provinces there is little of it, except in the large towns; from the central and southern parts of the country we hear of it as frequent in Novgorod,² Viatka,³ Kasan,⁴ Kursk,⁵ Kischnew,⁶ Odessa,⁷ Sebastopol,⁸ and Astrakhan;⁹ in Orenburg¹⁰ also it is not altogether rare. But among Kirghiz of the Steppes it is quite unknown; so much so that Neftel¹¹ did not see a single case of phthisis among them during a period of several years. In the Caucasus, consumption is prevalent mostly in the higher parts of the interior; it is but rarely seen along the course of the Rion or on the Black Sea coast.¹²

¹ Herrmann, 'Petersb. med. Zeitschr.,' 1870, N. F., i, 423.

² Bordowski, 'Med. Ztg. Russl.,' 1850, 171.

³ Jonin, ib., 1849, Nr. 45.

⁴ Blossfeld, 'Petersb. Journ. für Natur- und Heilkde.,' 1842, 151.

⁵ Gutteit, 'Med. Ztg. Russl.,' 1851, 255.

⁶ Heine, ib., 1845, 80.

⁷ Andrejewsky, in Gräfe and Walther's 'Journ. der Chir.,' xx, 277.

⁸ Herrmann, 'Med. Ztg. Russl.,' 1845, 380.

⁹ Id. ib., 335.

¹⁰ Maydell, 'Nonnulla med. topogr. Orenburg. spect.,' Dorpat, 1849.

¹¹ 'Würzb. med. Zeitschr.,' i, 61.

¹² Liebau, 'Petersb. med. Zeitschr.,' 1867, xi, 2, 6.

The distribution of phthisis in *North Germany* is shown in the following table:¹

Mortality from Phthisis in Prussia from 1875 to 1879.

Department.	Inhabitants per square kilom.	Deaths from phthisis per 1000 inhabitants.	Ratio in the urban population.	Ratio in the country population.	
Baltic	Gumbinnen . . .	47	1'96	2'77	1'84
	Königsberg . . .	52	1'74	2'49	1'45
	Danzig . . .	68	1'74	2'39	1'41
	Marienwerd. . .	45	1'61	2'54	1'35
	Stettin . . .	57	2'39	2'90	2'08
	Köslin . . .	39	1'85	2'58	1'60
	Stralsund . . .	52	2'57	3'21	2'12
Schleswig . . .	58	3'22	3'31	3'18	
Warthe and Oder	Posen . . .	59	2'30	2'96	2'04
	Bromberg . . .	50	2'20	3'13	1'85
	Breslau . . .	109	3'07	3'73	2'75
	Liegnitz . . .	73	2'52	2'98	2'35
	Oppeln . . .	104	2'55	2'99	2'45
Frankfurt . . .	55	2'54	3'08	2'25	
Prussian Saxony, the Mark, &c.	Potsdam . . .	53	2'53	2'88	2'33
	Magdeburg . . .	76	2'79	2'98	2'65
	Merseburg . . .	88	2'29	2'63	2'16
	Erfurt . . .	109	2'70	2'69	2'70
North Sea	Hanover . . .	74	3'99	3'38	4'44
	Hildesheim . . .	80	3'02	2'66	3'21
	Lüneburg . . .	33	3'47	3'85	3'39
	Stade . . .	47	4'01	3'18	4'20
	Osnabrück . . .	44	5'14	4'87	5'22
	Aurich . . .	64	3'67	3'31	3'79
Lower Rhine	Cologne . . .	164	5'11	4'76	5'34
	Treves . . .	85	3'55	3'53	3'56
	Aix . . .	121	4'02	3'64	4'59
	Coblenz . . .	92	4'33	4'26	4'35
	Düsseldorf . . .	267	5'29	5'22	5'29
	Münster . . .	61	5'17	6'50	4'70
	Minden . . .	91	4'71	4'73	4'90
Arnsberg . . .	127	4'86	5'46	4'51	
Upper Rhine	Cassel . . .	78	3'17	3'48	3'03
	Wiesbaden . . .	122	3'98	3'82	4'08

It follows from this table that the disease is much less common in the territory of the Vistula, Oder and Elbe, where the mortality is from 1'61 to 3'22 per 1000, than in

¹ In this table I have mostly followed the painstaking work of Schlockow.

the territory of the Weser and Rhine, where the mortality is from 2·66 to 6·50 per 1000. In the kingdom of Saxony, the yearly mortality, according to the figures for the years 1873-80, is 2·40 per 1000, or nearly as much as in the Prussian Department of Erfurt, the maximum of 2·81 to 2·77 falling in the circles of Dresden and Leipsig, with a minimum of 1·75 in the circle of Bautzen and one of 0·90 per 1000 in the circle of Zwickau. In the kingdom of Bavaria, for which I use the statistical returns of 1867-75, the annual mortality from phthisis has a mean of 3·14 per 1000; but the results cannot be compared with those obtained from other parts of Germany, inasmuch as they relate to all deaths from pulmonary consumption, from general tuberculosis, and from wasting in persons over fifteen, which should be compared separately to be correct. The Bavarian departments with the largest death-rates are Lower Franconia with 3·61, Middle Franconia with 3·49, and Upper Franconia with 3·24; next come the Palatinate with 3·20, the Upper Palatinate with 3·12, Swabia and Bavaria each with 3·06, while the minimum of 2·40 is reached in Lower Bavaria.

In the Grand Duchy of Baden, according to the figures for the years 1874-81, the mean annual death-rate from consumption is 2·78 per 1000 inhabitants, being distributed in the various circles as follows:

Mannheim ...	3·87	...	Heidelberg...	3·04	...	Mosbach ...	2·37
Karlsruhe ...	3·41	...	Offenburg ...	2·89	...	Villingen...	2·36
Baden	3·28	...	Constance ...	2·65	...	Waldshut	2·24
Freiberg	3·05	...	Lorrach	2·54			

In the Grand Duchy of Hesse the mean annual death-rate from phthisis was 2·73 per 1000 (according to the figures of 1877-81), Starkenburg having 2·83, Upper Hesse 2·42, and Rhenish Hesse 2·82. We shall have to notice later on the very remarkable comparative immunity of the elevated regions of Germany from consumption as contrasted with the low plains. The same relative infrequency of the disease is met with in the mountainous parts of Austria; whereas in level country and among the lower valleys of Galizia,¹ Upper

¹ Friedländer, 'Abhandl. österr. Ärzte,' vi, 197; Rohrer, 'Oest. med. Jahrb,' 1845, iii, 354.

Austria,¹ Styria² and Carinthia,³ consumption is very prevalent.

In *England*,⁴ as will be seen from the table (p. 172), the heaviest mortality (2·8 to 3·5 per 1000) falls in London and in certain of the northern and north-western counties (Notts, Derby, Cheshire, Lancashire, West Riding, Durham, Northumberland, Cumberland, South Wales and North Wales). The smallest mortality (1·8 to 2·2 per 1000) is found in the south-western and inland southern counties of Wilts, Dorset, Somerset, Herts, and Bucks; in the western inland counties of Gloucester, Hereford, Shropshire, Staffordshire, and Worcester; in the counties of Rutland and Lincoln, the North Riding, and the mountainous district of Westmoreland. From *Scotland* we have accounts⁵ of the very rare occurrence of the disease in the Western Highlands. Of *Ireland* Wyld⁶ says that phthisis is "by far the most fatal affection to which the inhabitants of this country are subject."

In *Holland*, as the figures in the table show, the chief centres of phthisis are in the north-eastern provinces of Overijssel and Drenthe, next in order being Utrecht, Friesland, and North Brabant; it is rarest in Zeeland and next rarest in South Holland and Limburg. Among the larger towns those most afflicted with consumption are Deventer, Zwolle, Breda, Utrecht, Haarlem, and Maastricht. In *Belgium*, as we learn from Meyne, there is most of it in the industrial centres, such as Brussels, Ghent, Bruges, Liège, St. Nicholas, Verviers and Ypres; while we have more special details of its extensive prevalence in Antwerp,⁷ Boom,⁸ Contich,⁹ Mechlin,¹⁰

¹ Kirchner, *ib.*, 1835, Nste. F., ix, 395; Ozlberger, *ib.*, 1844, iv, 360; Sauter, *ib.*, xx, 57.

² Weiglein, *ib.*, 1842, i, 131, 274; Onderka, 'Verhandl. der Wiener Aerzte,' ii.

³ Fradenneck, 'Zeitschr. der Wiener Aerzte,' 1844, i, 440.

⁴ The differences in the death-rate of phthisis in England as between the period of 1848-55 and the period of 1859-69 may be explained either by a decrease of the disease, or more probably, as I think, on the hypothesis that a good many errors had crept into the older statistics.

⁵ Smith, 'Edinb. Med. Journ.,' 1873, Jan., 607; Macdonald, *ib.*, Oct., 299.

⁶ 'Edinb. Med. and Surg. Journ.,' 1845, April, 281.

⁷ Gouzé, 'Annal. de la Soc. de méd. d'Anvers,' 1846, Nov., 605.

⁸ Thijs, *ib.*, 1845, Janv., 37.

⁹ Puytermans, 'Arch. de méd. Belg.,' 1845, Août, 181.

¹⁰ Loycks, *ib.*, Juin, 78.

Haecht¹ (Brabant), Ecloo² (West Flanders), Courtray,³ Furnes⁴ and Dikmude⁵ (both in East Flanders), and in Beauraing⁶ (Namur).

Few countries of Europe enjoy on the whole so favorable conditions as *Switzerland* in respect of the infrequency of consumption. According to Müller's⁷ inquiries the total mortality from phthisis is 1·86 per 1000 inhabitants; it was distributed as follows in the several cantons:

Table of Deaths from Consumption in Switzerland per 1000 inhabitants.

Canton.	Years observed.	Deaths per 1000 inhabitants.	Canton.	Years observed.	Deaths per 1000 inhabitants.
Baselstadt . . .	3	3·57	Ticino . . .	3-5	1·90
Grisons . . .	2-5	2·50	Vaud . . .	2-5	1·70
Geneva . . .	3-5	2·40	Zug . . .	5	1·60
Neuchâtel . . .	2-5	2·40	Baselland . . .	5	1·50
Schwyz . . .	3-5	2·30	Thurgau . . .	1	1·45
Schaffhausen . . .	5	2·10	Uri . . .	3	1·40
Aargau . . .	4-5	2·	Unterwalden . . .	3-4	1·40
St. Gall . . .	4-5	2·	Appenzell . . .	4	1·35
Zürich . . .	5	1·96	Vallais . . .	5	1·20
Bern . . .	3-5	1·90	Freiburg . . .	2	0·81

The comparatively high mortality of Baselstadt, Geneva and Neuchâtel is explained by the industrial character of the respective towns; that of the Grisons by the common occurrence of the disease in Chur (3 per 1000);⁸ that of Canton

¹ Severon, 'Journ. de méd. de Bruxell.,' 1852, Nov.

² Waldack, 'Annal. de la soc. de méd. de Gaud,' 1847, Janv., p. 69.

³ Account in 'Annal. de la soc. méd.-chir. de Bruges,' xiv.

⁴ Keuwes, ib., viii, 233.

⁵ Woets, ib., i, 17.

⁶ Sovet, 'Annal. de la Soc. de méd. d'Anvers,' 1840, p. 69.

⁷ 'Die Verbreitung der Lungenschwindsucht in der Schweiz,' Winterthur, 1876. These highly interesting researches are based upon the statistical returns of some two hundred Swiss practitioners. They give the number of deaths from consumption in the Swiss cantons from 1865 to 1869, and make reference at the same time to various circumstances in the etiology of the disease. Eight of these returns apply to the whole of a canton (Zürich, Thurgau, Baselstadt, Geneva, Appenzell, Freiburg, Zug and Uri); in the rest only a larger or smaller part of each canton is dealt with.

⁸ Ludwig, 'Das Ober-Engadin in seinem Einfluss auf Gesundheit und Leben,' Stuttgart, 1877.

Schwyz, as well as the small figure for Canton Freiburg, most probably by errors in the returns.

The information as to the extent of phthisis in *France* comes in fragments from the various parts of the country; and I am unable to form a general estimate of it. As in other countries, it is the great centres of commerce, trade and manufacture that form the chief seats of the malady. Whether, as Lombard alleges, it is more common in the northern and western departments than in the southern, eastern and central, I cannot decide. For *Spain and Portugal* also, there are only fragmentary notices of the distribution of consumption. It is prevalent to a very great extent on the central plateau of Spain (in New Castile and Estremadura)¹ as well as in certain of the larger ports on the western and southern coasts, such as Barcelona, Valencia, Cadiz and Gibraltar; Hennen's² statement that phthisis is "truly endemic" in these, having been subsequently confirmed by Chervin.³ To the same effect is the opinion of Wallace,⁴ of Trogher,⁵ and of Brandt⁶ on the frequency of the malady in Lisbon, the last-named remarking that it takes a foremost place among the diseases of the people in the plains of Portugal and in the densely populated towns.

The following are the official figures of the mortality from consumption in *Italy*⁷ for the years 1881-83, according to provinces:

*Table of the Death-rate from Phthisis in Italy per 1000 inhabitants.*⁸

Italy (general average).....				2'45
Lombardy	3'34	...	Æmilia	2'75
Latium (Rome)	3'18	...	Liguria	2'71
Toscana	3'16	...	Campania	2'43
Piedmont	2'86	...	Venetia	2'28

¹ Thierry, 'Observ. de physique et de méd. faites en différ. lieux de l'Espagne,' Par., 1791, i, 259, ii, 9; Faure, 'Souvenirs du Midi,' 74.

² 'Sketches of the Med. Topogr. of the Mediterranean, &c.,' Lond., 1830, 119.

³ 'Lond. Med. Gaz.,' 1840, Jan., xxv, 638.

⁴ 'Edinb. Med. and Surg. Journ.,' 1829, Jan., 76.

⁵ 'Wien. med. Wochensch.,' 1853, Nr. 8.

⁶ Dobell's 'Reports,' 1870, 388.

⁷ 'Statistica delle cause di morte anno 1881, 1882, 1883,' Roma, 1882-1884.

⁸ I may remark that deaths from general tuberculosis and tubercular meningitis are included.

Marches	2'06	...	Sicily.....	1'48
Umbria	1'87	...	Abruzzi (Molise).....	1'42
Sardinia	1'78	...	Calabria	1'36
Appulia	1'63	...	Basilicata.....	0'89

Assuming that these figures are trustworthy, or that the same unavoidable sources of error have recurred in all the localities, it follows that there is a considerable preponderance of the disease in the northern provinces, and that its frequency diminishes very decidedly as we go southwards.

In *Roumania* consumption is unusually common, according to the testimony of all authorities.¹ In *Turkey*² also, and particularly in Constantinople, the disease is far from rare, being met with very extensively among the Turkish troops.³ In the island of *Cyprus* it is said to be almost unknown.⁴ In like manner *Greece* would seem to be comparatively well off in respect to the rarity of consumption;⁵ thus it is spoken of as being seldom met with in *Laconia*.⁶

According to casual notices from the counties of *Nearer Asia*, such as the plateau of *Armenia*, the coast plains of *Syria* and the table-land of *Persia*, phthisis would seem to be a comparatively rare trouble.

As regards *Armenia*, Wagner⁷ says that the disease is seen only in persons who have migrated from Arabia, Mesopotamia or the countries of the negro. Polack⁸ says the same of the Persian plateau, where the indigenes in-

¹ Barasch, 'Wien. med. Wochenschr.,' 1854, Nr. 41; Champouillon, 'Mém. de méd. milit. 1868,' Mars, 191; Leconte, 'Considér. sur la pathol. des provinces, du Bas-Danube,' Montp., 1869; Felix, 'Die sanitären Zustände Rumäniens,' Berl., 1883, 32.

² Oppenheim, 'Ueber den Zustand der Heilkunde . . . in der Türkei,' Hamb., 1833, 69; Rigler, 'Die Türkei und deren Bewohner,' i, 283; ii, 238; Beyran, 'Gaz. méd. de Paris,' 1854, 342.

³ Sandwith, 'Assoc. Med. Journ.,' 1854, Mai, 435.

⁴ Cullen, 'Med. Press and Circular,' 1880, Nov.

⁵ Roser, 'Ueber einige Krankheiten des Orients,' Augsb., 1837, 79; Olympics, 'Correspondenzbl. bayerischer Aerzte,' 1840, 181; Wibmer in Schöpf, 'Jahresbeiträge,' Pesth, 1841.

⁶ Valassopoulos, in 'Congrès des médecins Grecs, tenu 1882,' Constantin., 1883, 17.

⁷ 'Reise nach Arrarat,' Stuttg., 1848.

⁸ 'Zeitschr. der Wien. Aerzte,' 1859, p. 140.

habitants enjoy an almost absolute immunity. The rarity of the disease on the plains of Syria is attested by Yates,¹ Robertson,² Tobler³ (for Jerusalem) and Barret⁴ (for Beyrout). It is more frequently seen in the Lebanon,⁵ in the neighbourhood of Baalbec and of Aleppo, where Guys⁶ tells us that it is truly endemic; also on the *Arabian* shore of the Red Sea, especially among those Bedouins "who have exchanged the tent," as Pruner⁷ says, "for the stone-built house."

As in the countries just spoken of, so also in *India*,⁸ the prevalence of phthisis cannot be given in figures. It is on the whole rarer in that part of the world than in the temperate zone of the Eastern Hemisphere, but by no means so rare as the earlier observers supposed, from their imperfect means of diagnosis.⁹ In some districts it is, in fact, common, particularly among the English troops: as in the plain of Upper Bengal¹⁰ stretching along the foot of the Himalaya, in the district of Madras (among natives as well),¹¹ at places

¹ 'Med. Gaz.,' 1844, Feb., p. 566.

² 'Edin. Med. and Surg. Journ.,' 1843, April, p. 247.

³ 'Beiträge zur med. Topogr. von Jerusalem,' Berlin, 1855, p. 42.

⁴ 'Arch. de méd. nav.,' 1878, Août, p. 87.

⁵ Robertson, l. c.

⁶ 'Statistique du Paschalik d'Alep,' Marseille, 1853, p. 63.

⁷ 'Krankheiten des Orients,' p. 341.

⁸ The 'Army Medical Reports' for India cannot be used to determine the death-rate from consumption in that country, for the double reason that it is not known how many of the soldiers had arrived in India with the disease upon them, and that soldiers who are on the sick-list for consumption are invalided home to England.

⁹ As early a writer as Conwell ('Observations chiefly on Pulmonary Disease in India,' Malacca, 1829, p. 5) remarks: "It is a generally received error that pulmonary disease in India is rare and readily cured;" and he adds that the error had formerly been shared by himself, until, on returning to India provided with the improved means of physical examination, and obtaining access at the same time to a larger field of observation, he became convinced that the idea was a mistake. For other statements as to the not infrequent occurrence of consumption in India, see Twining, 'Clin. Illustr. of Dis. in Bengal,' Calcutta, 1835, i, 26; Webb, 'Pathol. Indica,' p. 99; Gordon in 'Med. Times and Gaz.,' 1856, Aug., p. 188; Morehead, 'Clinical Researches, &c.,' ii, 394; Maclean in 'Army Med. Reports,' 1862, p. 442; Ranking in 'Madras Quart. Med. Journ.,' 1863, July, p. 56; Ewart, in 'Indian Med. Gaz.,' 1868, May, and in 'Brit. Med. Journ.,' 1881, May, p. 809.

¹⁰ Webb, l. c., p. 100, c.

¹¹ Short, 'Madras Quart. Journ. of Med. Sc.,' Druitt, 'Med. Times and Gaz.,' 1873, June, p. 634.

on the Malabar Coast¹ such as Cochin² and Cannanore,³ at Bombay,⁴ in certain localities of the North-West Provinces,⁵ and in the Punjaub, where Hinder⁶ found it very prevalent among the natives of Amritsur. It does not occur so often in Lower Bengal and Assam,⁷ nor in Upper Sind;⁸ extremely seldom on the plateaus of the Western Ghâts at levels of 4000 to 7000 feet,⁹ or in the Nilghiri Hills,¹⁰ or on the northern and southern slopes of the Himalaya.¹¹

On one point all the authorities in India are agreed—that the disease in that country is of an extremely pernicious type; and the same is true of it in all other tropical regions of Eastern Asia, including *Ceylon*, the *East Indies*, *Further India* (*Cochin China* in particular), *China* and *Japan*.

In Ceylon, consumption is found mostly among the black population.¹² In the Malay Archipelago, the disease is far from rare, as we may infer from the above reference to the great mortality caused by it among the native troops; all the authorities¹³ write in that sense, mention being made more particularly of its common occurrence in Ambonia,¹⁴ and in the Philippines especially at Manilla.¹⁵ In Sumatra it would seem to be rare.¹⁶ The French medical officers¹⁷ are entirely agreed as to the

¹ Hunter, 'Med. Gaz.,' 1850, ii, 367.

² Day, 'Madras Quart. Journ. of Med. Sc.,' 1861, April, p. 320.

³ Morgan, *ib.*, 1841, ii, 134.

⁴ Hunter, *l. c.*; Morehead, *l. c.*

⁵ Jackson, 'Trans. Calcutta Med. Soc.,' 1818, i, 292; Webb, *l. c.*

⁶ 'Med. Times and Gaz.,' 1854, Sept., p. 538.

⁷ Ewart, 'Lancet,' 1880, May.

⁸ Don, 'Trans. Bombay Med. Soc.,' 1839, iii, 10; Collier (*ib.*, 1862, New Ser., vii, Append. xxxv) says that the disease is not altogether rare among the English troops in Upper Sind, and very malignant.

⁹ Murray, *ib.*, 1838, ii, 45; Gibson, *ib.*, p. 200.

¹⁰ Young, 'Trans. Calcutta Med. Soc.,' 1823, iv, 36.

¹¹ Schlagintweit, 'Boston Med. and Surg. Journ.,' 1848, Dec., p. 346; Curran, 'Dublin Journ. of Med. Sc.,' 1871, Aug., p. 101.

¹² Davy, 'Account of the Interior of Ceylon, &c.,' Marshall, 'Notes on the Med. Topogr. of the Interior of Ceylon,' Lond., 1822.

¹³ Lesson, 'Voyage autour du monde,' Par., 1829, 97; Heymann, 'Darstell. der Krankh. der Tropenländer,' Würzb., 1855, 158; ref. in 'Arch. de méd. nav.,' 1867, Sept., 171; v. d. Burg, 'De geneesheer in Nederlandsch-Indie,' Batav., 1862, i, 81.

¹⁴ Ref. in 'Arch. de méd. nav.,' 1870, Janv., 14.

¹⁵ Taulier, 1877, Dec., 401; Sollaud, *ib.*, 1882, Sept., 167.

¹⁶ v. Leent, 'Arch. de méd. nav.,' 1877, Févr., 81.

¹⁷ Olivier, 'Observ. faites en Algérie, Chine et Cochinchine,' Strassb., 1864, 87; Richaud, 'Arch. de méd. nav.,' 1864, Mai, 353; Linquette, 'Mém. de méd.

great frequency and pernicious type of phthisis in Cochin China. There are reports to the same effect from various parts of China,¹ such as Canton and Hong Kong,² Chang-fu,³ Tien-tsin,⁴ and Pekin;⁵ at other ports, such as Shanghai and Hankow⁶ it is not so common. In Japan phthisis holds one of the first places among the causes of death.⁷

Consumption is prevalent to a most disastrous extent among the native races of the *Southern Pacific*.⁸ We have more particular accounts for Fiji and Tonga,⁹ Samoa,¹⁰ Tahiti,¹¹ the Marquesas,¹² and Hawaii¹³ (Honolulu). In New Caledonia¹⁴ the death-rate from consumption among the Kanakas is estimated at two-fifths of the mortality from all

milit., xi, 1864, 97; Breton, 'Quelques considér. sur la guérison des plaies chirurg. chez les Annamites,' Par., 1876, 10; Beauvils, 'Arch. de méd. nav.,' 1882, Avril, 262.

¹ Darburquois, 'Notes sur les malad. des Européens en Chine et au Japon,' Par., 1872, 46; Hobson, 'Med. Times and Gaz.,' 1860, Dec., 632.

² Armand, 'Gaz. méd. de Paris,' 1861, Nr. 17, Feuille; Smart, 'Transact. of the Epidemiol. Soc.,' 1862, i, 223.

³ Lagarde, 'Arch. de méd. nav.,' 1864, Mars, 190.

⁴ Ref., ib., 1866, Juill., 12.

⁵ Morache, 'Annal. d'hyg.,' 1870, Janv., 5.

⁶ Smith in 'Dobell's Reports,' 1870, 35. Among 6935 patients treated at the Mission Hospital of Hankow, there were 34 with phthisis and 63 with hæmoptysis. See also Dudgeon, 'Glasgow Med. Journ.,' 1877, July, 322.

⁷ Ref. in 'Arch. de méd. nav.,' 1866, Avril, 280; Potoenik, ib., 1875, 237; Maget, ib., 1877, Mai, 379; Wernich, 'Geogr.-med. Studien, &c.,' Berl., 1878, 196; Godet, 'Étude sur l'hygiène au Japon,' Par., 1880, 54; Scheube, 'Congrès international de médecins des Colonies,' Amsterd., 1884, 243.

⁸ Brunet, 'La race Polynésien, son origin, sa disposition,' Paris, 1876, 26.

⁹ Wilkes in 'U. S. Explor. Exped., Philad.,' 1845, iii, 32; Ref. in 'Arch. de méd. nav.,' 1866, Jan., 28, 32.

¹⁰ Turner, 'Glasgow Med. Journ.,' 1870, Aug., 502.

¹¹ Ref. in 'Arch. de méd. nav.,' 1865, Oct., 288; 1866, Jan., 22; Schwarz, 'Zeitschr. der Wiener Aerzte,' 1859, 536; Herconet ('Études sur les malad. des Européens aux îles Tahiti,' Par., 1880, 39) says that phthisis is as widely prevalent among the natives as it is rare among the Europeans. That is probably the explanation of the statements by Chassaniol and Guyot, 'Arch. de méd. nav.,' 1878, Janv., 70.

¹² Ref., ib., 1865, Oct., 297; Clavel (ib., 1884, Août, 148) says that phthisis is rarer here than in Tahiti.

¹³ Ref. in 'Arch. de méd. nav.,' 1864, Decbr., 488; Le Roy, 'Relat. méd. du voyage de la Persévérance dans l'Océan Pacifique de 1855-58,' p. 60.

¹⁴ Vinson, 'Topogr. méd. de la Nouvelle-Calédonie,' Par., 1858; de Rochas, 'Essai sur la topogr. hyg. et méd. de la Nouvelle-Calédonie,' Par., 1860, 17, 30; Bourgaue, 'Mém. de méd. milit.,' 1866, Avril, 338; Charlopin, 'Notes rec. en Calédonie de 1863 à 1867,' Montp., 1868, 18, 33; Navarre, 'Étude méd. de la presqu'île Ducos,' Par., 1879, 36; Boyer, 'Arch. de méd. nav.,' 1878, Sept., 225.

causes. Almost all the authorities are of opinion that the great prevalence of the malady in these islands dates from the time when the natives began to come into more intimate relation with European immigrants, and therewith to make considerable changes in their mode of life; and that opinion is borne out by the fact that in the Hawaiian Islands, where phthisis at the present time commits great ravages among the natives, it was of rare occurrence forty or fifty years ago.¹ On the other hand, it follows from Wilson's account (1806) of the state of health in Tahiti,² that phthisis had been widely prevalent in that group as early as the beginning of the century; and there are accounts to the same effect from the Tonga group, New Caledonia, and other of the archipelagoes of Polynesia.

The reputation that *Australia* used to enjoy for the rarity of consumption and for the favorable influence of its climate upon the course of the malady, has of late been shown to be a mistaken one. In Victoria, where the disease, it is true, has become a good deal more common only within recent years, the mortality from phthisis in 1866 was 6 per cent. of the mortality from all causes,³ while in Melbourne itself the death-rate rose between 1865 and 1869 from 2.22 to 2.52 per 1000 of the population.⁴ In Tasmania it would not seem to be common; during five years' practice Hall⁵ saw 235 cases at Hobart, only 37 of whom had been born in the Colony, all the rest being immigrants from Europe. In New Zealand phthisis has made frightful ravages among the Maoris, and has been one of the chief causes of the gradual extinction of that race.⁶

Among the islands on the eastern side of Africa, *Mauritius* and *Réunion* are the two most subject to consumption. On

¹ See Chapin, 'Amer. Journ. of Med. Sc.,' 1837, May, p. 43; Gulick, 'New York Journ. of Med.,' 1855, March.

² 'Edin. Med. and Surg. Journ.,' 1806, July, p. 284: "Phthisis pulmonalis," he says, "is, I believe, more frequent and proves sooner fatal than with us."

³ Richardson, 'Edin. Med. Journ.,' 1869, March, p. 802.

⁴ Thomson, 'On the Supposed Influence of Climate on Phthisis,' Melbourne, 1871 and 1879. See also Reeves, 'Consumption in Australia,' Melb., 1874.

⁵ 'Trans. Epidem. Soc.,' 1865, ii, 85.

⁶ Swainson, 'On the Climate of New Zealand,' Lond., 1840, p. 58; Thomson, 'Edinb. Med. and Surg. Journ.,' 1850, July, p. 82, and in 'Brit. and Foreign Med.-Chir. Rev.,' 1854, Oct.; Take, 'Edin. Med. Journ.,' 1863, Sept., p. 221.

Nossi Bé also the malady is not uncommon among the coloured races, particularly the Caffirs.¹ In *Madagascar* and *Mayotte*² it is as common as in Europe, and rapidly fatal, as it mostly is in the tropics.³ In *Zanzibar*, Lostalot⁴ did not happen to see many cases, but it is said to be especially common among the Arabian women of the higher class.⁵

Referring to its prevalence in Mauritius, Lesson says: "Peu de contrées offrent un aussi grand nombre de phthisies pulmonaires et laryngées et de catarrhes chroniques, que l'île Maurice; la première de ces affections moissonne un grand nombre d'individus." There is some confirmation given to that statement by the comparatively high mortality among the British troops in the island (3·9 per 1000 of the total strength over a period of nineteen years). In like manner Couzier⁷ says of the disease in Réunion: "La phthisie, que l'on voit assez fréquemment dans ce pays, n'est point une maladie chronique, comme partout ailleurs; elle parcourt ses différentes périodes avec toute la vivacité d'une maladie aiguë;" and almost to the same purport is Doutroulau's⁸ statement: "La phthisie enfin est commune et marche avec une grande rapidité, plus encore chez les indigènes que chez les Européens."

In *Cape Colony* phthisis is oftenest met with among the Hottentots inhabiting the plains nearest the coast; in other classes of the population it is much rarer⁹ than in the East African islands within the tropics, just spoken of; while on the interior plateau of Southern Africa it hardly occurs at all.¹⁰ There is a lack of information of a trustworthy kind as to the state of health on the southern part of the *West Coast of Africa*—the coast of Lower Guinea. Around the *Bights of Benin*

¹ Guisl, 'Arch. de méd. nav.,' 1882, Nov., p. 329; Deblenne, 'Géographie méd. de l'île Nossi-Bé,' Paris, 1863, p. 210.

² Grenet, 'Souvenirs méd. de quatre années à Mayotte,' Montp., 1866.

³ Davidson, 'Edin. Med. Journ.,' 1863, March, p. 831; Borchgrevink, 'Norsk Mag. for Laegevidensk.,' 1872, iii, R. ii, 235.

⁴ 'Étude sur la constitution phys. et méd. de l'île de Zanzibar,' Paris, 1876 p. 45.

⁵ Burton, 'Zanzibar, its City, &c.,' London, 1872.

⁶ 'Voyage méd., &c.,' p. 143.

⁷ 'Journ. de méd.,' vii, 406.

⁸ 'Traité des maladies des Européens dans les pays chauds,' Par., 1861, 51.

⁹ Scherzer, 'Zeitschr. der Wiener Aerzte,' 1858, 152; Schwarz, ib., 630; Black, 'Edinb. Med. and Surg. Journ.,' 1853, Apr., 256; Fritsch, 'Arch. für Anat. und Physiol.,' 1867, 733.

¹⁰ 'Sketches of the Med. Topogr. of the Gulf of Guinea,' Lond., 1849, 53, 94, 138, 180.

and Biafra (country of the Cameroons and of the Gaboon), as well as in the adjoining island of *St. Thomas*, it appears from the entirely trustworthy writings of Daniell¹ that phthisis is widely prevalent and very malignant among the negroes. As regards the French settlements on the Gaboon Coast that statement is fully borne out by the French medical practitioners;² and we have an account to the same effect regarding its occurrence on the island of *Fernando Po*.³ The circumstances in respect to phthisis are more favorable among the natives of the *Gold Coast* and of *Sierra Leone*.⁴ Among the islands of the *Cape Verde* group, Mayo is but little affected by the malady, while *St. Jago* and *Fogo* are much subject to it.⁵ We are unable to form a trustworthy conclusion of the extent of its prevalence on the *Coast of Senegambia*; the older accounts by Thevenot⁶ and Berville⁷ speak of it as very rare; and so far in agreement therewith Chassaniol,⁸ Borius,⁹ Gauthier¹⁰ and others state that it is at all events rarer than in France. On the other hand, Carbonell¹¹ shows from the statistics of mortality at *St. Louis* that consumption makes up a considerable proportion of the deaths, while Defaut,¹² writing of *Gorée*, says: "La phthisie pulmonaire est fréquent, et on peut dire que toutes les classes d'habitants y sont exposées; en effet, les noirs fournissent un contingent considérable, et les blancs en sont souvent atteints." Among the nomade tribes of the interior, as Carbonell states, the malady is of rare occurrence. According to the same authority the death-rate from phthisis among the French garrison from 1862 to 1865 was 2·7 per

¹ Abelin, 'Étude méd. sur le Gabon,' Par., 1872, 31; Bestiou, 'Arch. de méd. nav.,' 1881, Nov., 379.

² Quétan, ib., 1868, Jan., 73.

³ McRitchie, 'Edinb. Monthly Journ. of Med. Sc.,' 1852, May, 414.

⁴ Hopffer, 'Arch. de méd. nav.,' 1877, Mars, 180.

⁵ 'Traité des malad. des Européens dans les pays chauds, &c.,' Par., 1840, 251.

⁶ 'Remarques sur les maladies du Sénégal,' Par., 1857.

⁷ 'Arch. de méd. nav.,' 1865, Mai, 510.

⁸ Ib., 1882, Avril, 314.

⁹ 'Des endémies au Sénégal,' Par., 1865, 17.

¹⁰ 'De la mortalité actuelle au Sénégal,' Par., 1873, 16.

¹¹ 'Hist. clinique de l'hôpital maritime de Gorée, &c.,' Par., 1877, 119.

¹² Thévenin, 'Gaz. méd. de l'Algérie,' 1869, Nr. 7, 86; reference in 'Med. Times and Gaz.,' 1877, July, 96.

1000 of the total strength, and from 1869 to 1871 2.72; in a battalion of natives numbering 450 men there were 23 deaths from consumption in fifteen years, giving a mortality of 3.4 per 1000. He adds that "la population noire du Sénégal est, comme partout ailleurs, très sujette à la phthisie." As in tropical countries generally, the disease among the Europeans resident there runs a very rapid course.

Several of the territories on the *North Coast of Africa* enjoy a notable exemption from phthisis. In Mogador, Morocco and other places on the coast of the Sultanate of Morocco, the disease is mentioned as one that rarely occurs.¹ In *Algiers*, also, it is a good deal less prevalent than in Europe; although the extremely favorable reports by French physicians of a former period² as to its rarity in that country have not been fully confirmed. But all the more recent observers are agreed that phthisis is comparatively rare among the French, both civilians and military; while among the native population, and particularly among those living outside the towns, either occupied in agriculture or leading a nomadic life, it is still less frequently met with. The accounts from the province of Oran³ are especially favorable; in the capital town of that name with a population of 25,000, not more than twelve cases of phthisis had occurred in eight years, and these were strangers of whom only three or four had been taken ill subsequent to their arrival. In the last two years of the period not a single case had been known there. At two other places in the province, whose inhabitants numbered 2130 Europeans and 4300 natives, Gaucher met with ten cases of phthisis in three years.

Pietra Santa,⁴ who writes of the province of Alger, and assigns to the capital the somewhat high average death-rate from phthisis of 2.7 per 1000 inhabitants over a period of eight years, goes on to say of the agricultural or nomadic population of the province: "Tous les documents s'accordent à prouver, que la phthisie est extrêmement rare chez les divers ébranche-

¹ Guyon, 'Gaz. méd. de Paris,' 1842, No. 22; Haspel, 'Maladies de l'Algérie,' Paris, 1852, ii, 418.

² Couloudon-Rougier, 'Gaz. méd. d. l'Algérie,' 1874, No. 11, p. 122; Boyron, ib., 1876, No. 1, p. 9; Gaucher, ib., 1876, No. 3, p. 31.

³ 'Gaz. hebdomad. de méd.,' 1860, p. 603.

⁴ Creissel, 'Mém. de méd. milit.,' 1873, Juill., p. 337.

ments de la race arabe." There is information to the same effect for the native population of the cultivated oases in the Algerian Sahara,¹ particularly for the nomadic inhabitants of Great Kabylia, who enjoy, according to all authorities,² an almost absolute immunity from consumption. In Algiers, as in many other tropical or subtropical countries, it is the negro race that seems to be most subject to the disease.

Along the seaboard of *Tunis*,³ *Egypt*,⁴ and *Abyssinia*⁵ phthisis is found more often than in Algiers, among the natives as well as in others. In Egypt, as Pruner tells us, the disease becomes less in exact proportion as we proceed southwards from the shore of the Mediterranean; in Central and Upper Egypt it is decidedly uncommon,⁶ but in Khar-toum and Sennaar, as well as over the whole basin of the Nile beyond the tropic, it again becomes somewhat prevalent.⁷ The plateau of Abyssinia is almost free from consumption;⁸ Blanc states that he did not see a single case of it among thousands of patients during a lengthened residence in that country.

In the *Western Hemisphere* the inhabited regions within northern latitudes, and with an Arctic climate, offer a marked contrast to the corresponding territories of Europe, in respect to the great frequency of phthisis in them. In *North Greenland* that disease is one of the commonest causes of death.⁹ At a trading station on the northern shore of *Hudson's Bay* phthisis is prevalent among the scanty population to an enormous extent, according to the evidence of a practitioner

¹ Bazille, 'Gaz. méd. de l'Algérie,' 1868, p. 41; Bertrand, 'Mem. de méd. milit.,' 1867, Mars, p. 199; Claudot, ib., 1877, Mai, p. 271.

² Armand, 'Méd. et hyg. des pays chauds,' Paris, 1853, p. 375; Bertherand, 'Med. et hyg. des Arabes,' Paris, 1855.

³ Ferrini, 'Saggio sul clima . . . di Tunisi, &c.,' Milano, 1860, 225; Catrin, 'Mém. de méd. milit.,' 1883, Nr. 21, 322; Friocourt, 'Arch. de méd. nav.,' 1884, Juill., 17.

⁴ Pruner, l. c., 340; Mayer, 'Arch. de méd. nav.,' 1869, Mai, 326; Vauvray, ib., 1873, Sept., 161; Friocourt, ib., 1884, Août, 89.

⁵ Pruner, l. c.; Griesinger, 'Arch. für physiol. Heilkde.,' 1853, xii, 519.

⁶ Griesinger, l. c.; Isambert, 'Gaz. méd. de Paris,' 1857, 233; Zagiell, 'Du climat de l'Égypte, &c.,' Par., 1866; Pissas, 'Congrès des méd. Grece, tenu 1882.' Constantin., 1883, 17.

⁷ Pruner, l. c.; Brocchi, 'Giornale,' v, 598; Isambert, l. c.

⁸ Griesinger, l. c.; Blank, 'Gaz. hebdom. de méd.,' 1874, 333.

⁹ v. Haven, 'Ugeskrift for Laeger,' 1881, vi, 185.

who had been five years on the station;¹ and there are reports to the same effect from *New Archangel* and the *Aleutian Islands* (Alaska).² It is common also in *Newfoundland*,³ *New Brunswick* and *Canada*, in the last particularly among the native Indians (Stratton).

In the *United States* phthisis occurs, speaking generally, under the same circumstances and with the same frequency as in European countries; and it is a very notable fact that it has increased in a marked degree of late years in many parts of the States, a share of such increase being assignable to the influence of commercial and industrial progress. In the Northern States we have to note a considerable difference in the amount of phthisis between the New England States, with New York and New Jersey, on the one hand, and the Western States of Indiana, Illinois, Michigan,⁴ Wisconsin, Iowa and Minnesota on the other.

In the first group, according to the decennial census taken in each of the years 1850, 1860, and 1870, the mortality from phthisis varied between 2.51 and 2.54 per 1000 of the population; whereas in the Western States it was from 1.11 to 1.34 per 1000, an increase having taken place as will be seen in both cases.⁵ Another region of United States territory distinguished for the rarity of phthisis is formed by the lofty plains on the eastern and western slopes of the Rocky Mountains; of this fact we are assured by a number of army medical officers, such as Wood⁶ for Fort Laramie in Wyoming (7123 feet), Bartholow⁷ for Fort Bridger in Utah (7800 feet), and Hammond⁸ for Socorro in New Mexico (4600 feet). In the mountainous districts of California, also, the good influence of

¹ According to Andrew, 'Brit. Med. Journ.,' 1884, April, 657.

² Blaschke, 'Topogr. med. portus Novi-Archangelensis,' Petrop., 1842, 66; Romanowski, 'Med. Ztg. Russl.,' 1849, 153; ref. in 'Arch. de méd. nav.,' 1864, Dec., 874.

³ Gras, 'Quelques mots sur Miquelon,' Montp., 1867, 36; Anderson in 'Do-
bell's Reports,' 1870, 365, 1871, 198.

⁴ The State of Michigan has been comparatively free from phthisis from the time of its first settlement (Beech, 'Trans. Amer. Med. Assoc.,' 1859, xii).

⁵ Davis, *ib.*, 1878, xxix, p. 148.

⁶ 'Med. and Statist. Report on the Sickness and Mortality in the U. S. Army, 1839-54,' Washington, 1856, p. 81.

⁷ 'Amer. Journ. of Med. Sc.,' 1860, April, p. 323. In Salt Lake City the death-rate from phthisis, according to the census of 1870, was only 1.08 per 1000 inhabitants.

⁸ 'U. S. Army Reports,' p. 419.

elevation in reducing the amount of phthisis is shown by contrast with the much greater prevalence of the disease along the littoral of that State.¹ The early observers agree with the more recent² in asserting the very great amount of phthisis among the Indians occupying the plain in the lower valley of the Columbia River (Washington Territory), equally in the interior (or to the east of the Cascade Range) and on the coast.

When we compare the amount of phthisis in the Northern and Southern States, there are on the whole no considerable differences to be found. In the large cities of the Southern and Central States such as New Orleans, Montgomery, Memphis, Mobile, Charleston, Richmond, Norfolk and Baltimore, the annual mortality from consumption ranges between 2.82 and 4.25 per 1000 inhabitants, equalling, therefore, if not even exceeding the death-rate in the large and populous centres of industry in the North. It may be specially noted that a considerable increase in the amount of phthisis has lately been remarked among the negroes in Arkansas.³

The elevated plains and mountain valleys of *Mexico* and other *Central American* countries, over 3000 feet above the sea-level, enjoy, like those of the United States, an immunity from consumption more or less pronounced; on the other hand the disease is very widely spread and at the same time of a very malignant type on their low plains and coasts. Thus while the authorities are unanimous in asserting the rarity of phthisis on the Anahuac or table-land of Mexico,⁴ and on the lofty plains of Honduras, San Salvador,⁵ Costa

¹ According to Gibbons ('Trans. State Med. Soc. of California,' 1872), places on the southern part of the coast, such as Los Angeles, San Diego, San Luis and Obispo, have a very small death-rate from phthisis. In San Diego, according to the census of 1870, it was 1.33 per 1000 inhabitants (Gleitsmann).

² Wilkes, 'U. S. Explor. Exped.,' iv, 369; Suckley, 'Trans. Amer. Med. Assoc.,' 1857, xi. ("Throughout the country phthisis pulmonalis appears to be the most common non-specific disease with the aborigines.") Heger, 'U. S. Army Reports,' 1885-59, Washington, 1860, p. 263.

³ Account in the 'Trans. State Med. Soc. of Arkansas,' 1873.

⁴ Newton, 'Med. Topogr. of the City of Mexico,' New York, 1848; Müller, 'Monatsbl. für med. Statistik,' 1837, No. 6, p. 41; Jourdanet, 'Le Mexique et l'Amerique tropicale,' Paris, 1864, p. 149; account in the 'Boston Med. Journ.,' 1867, Feb., p. 86; Poncelet, 'Mém. de méd. milit.,' 1863, Mars, p. 226; Wouillot, 'Presse méd. Belge,' 1866, No. 40; Coindet, 'Mém. de méd. milit.,' 1867, Avril.

⁵ Guzman, 'Essai de topogr. phys. et méd. de la République du San Salvador,' Paris, 1869, p. 117.

Rica¹ and Panama;² we have particular information of its frequency and malignancy in Tampico³ and Vera Cruz⁴ (east coast of Mexico), in Campeché and Merida (coast of Yucatan),⁵ in Guaymas and Mazatlan⁶ (west coast of Mexico), on the Nicaraguan or Mosquito Coast,⁷ and on the Panama coast.⁸

The large amount of consumption in the *West Indies* had been remarked upon by many of the earlier observers,⁹ and their statements have been fully borne out by the more recent accounts from Cuba,¹⁰ St. Thomas,¹¹ St. Martin,¹² St. Vincent,¹³ St. Bartholomew,¹⁴ Guadeloupe,¹⁵ Martinique (where phthisis causes more deaths than any other disease except dysentery),¹⁶ St. Lucia,¹⁷ Barbadoes¹⁸ and Trinidad.¹⁹ The disease is equally common and pernicious on the coast and plains of *Guiana*;²⁰ whereas it is almost unknown among the natives inhabiting the mountainous part of the country.²¹

¹ Wagner and Scherzer, 'Die Republik Costarica,' Leipzig, 1856.

² Wagner, 'Beitr. zur Meteorologie und Klimatologie von Mittel-Amerika,' Dresd., 1864, 23. ³ Douillé, 'Montpellier médical,' 1872, Août, 109.

⁴ Heinemann in Virchow's 'Arch.,' 1867, xxxix, 607 und 1873; lviii, 179.

⁵ Jourdanet, l. c.

⁶ Lucas, 'La frégate Victoire à Guaymas et à Mazatlan,' Par., 1868, 40.

⁷ Bernhard, 'Deutsche Klin.,' 1854, Nr. 8; Young, 'Narrative of a Residence on the Mosquito Shore,' Lond., 1847.

⁸ Lidell, 'New York Journ. of Med.,' 1852, July, p. 93; account in 'Arch. de méd. nav.,' 1864, Oct., p. 286. According to Buel ('Amer. Journ. of Med. Sc.,' 1859, Jan., p. 135) and Horner (ib., April, p. 362) consumption would appear to be a comparative rarity in Panama. That is also Schwalbe's statement for Costa Rica ('Arch. für klin. Med.,' 1875, xv, 323).

⁹ Pouppe-Desportes, 'Hist. des malad. de St. Domingue,' Par., 1770, ii, 134; Chisholm, 'Manual of the Climate and Diseases of Tropical Countries, &c.,' Lond., 1822, 108.

¹⁰ Dupont, 'Notes et observ. sur la côte orientale d'Amérique,' Montp., 1868, 53.

¹¹ Barclay, 'Bibl. for Laeger,' 1830, i, 110.

¹² Hamon-Dufougeray, 'Arch. de méd. nav.,' 1883, Janv., 57.

¹³ Hunter, 'Lond. Med. Gaz.,' 1849, ii, 187. ¹⁴ Goës, 'Hygiea,' 1868, xxx, 460.

¹⁵ Dutroulau, 'Traité,' 36; Batby-Berquin, 'Notes sur quelques malad. observ. à la Guadeloupe,' Par., 1873, 10; Carpentin, 'Étude hyg. et méd. de Camp Jacob (Guadeloupe),' Par., 1873, 39.

¹⁶ Ruz, 'Arch. de méd. nav.,' 1869, Oct., 264.

¹⁷ Levacher, 'Guide med. des Antilles,' Par., 1840, 163.

¹⁸ Jackson, 'Boston Med. and Surg. Journ.,' 1867, July, 448.

¹⁹ 'Edinb. Med. and Surg. Journ.,' 1818, Nov., 597.

²⁰ See Hancock, 'Observ. on the Climate . . . of British Guayana,' Lond., 1835, 36; Pop, 'Nederl. Tijdschr. voor Geneesk.,' 1859, iii, 214, 217; Laure, 'Considér. sur les malad. de la Guayane, &c.,' Par., 1859, 46; Riou-Kérangal, 'Arch. de méd. nav.,' 1867, Juill., 70.

²¹ Hancock, Laure, ll. cc.

"Après le fièvre des marais," says Laure, "qui semble l'état normal de la constitution médicale, il n'est pas de maladie plus répandue à la Guayane que la phthisie, et sans doute celle-ci aurait plus de part dans la mortalité générale, si la cachexie ne prélevait sur l'enfance un large tribut." In like manner Riou-Kérangal says: "La facilité avec laquelle la plus simple bronchite devient tuberculeuse est un des faits les plus saillants de la pathologie des pays chauds, surtout à la Guayane française; la marche rapide de la maladie s'accorde conséquemment avec cette observation."

Within the last fifty or sixty years there has been a very extensive diffusion of phthisis along the whole littoral of Brazil,¹ from Pernambuco to Santa Catarina, as well as on the littoral of Uruguay² and the Argentine Republic,³ and in the basin of the Rio de la Plata, including Paraguay.⁴ It is the large seaports that suffer most; thus, Béringer gives the mortality from phthisis in Pernambuco as 5·2 per 1000 inhabitants, the negroes and mulattoes furnishing the greater part of it. In Rio de Janeiro, as we learn from Rey, the mortality from consumption has been on the increase; from 1855 to 1858 14 per cent. of the deaths from all causes (which came to 35 per 1000 inhabitants) were from phthisis, whereas from 1867 to 1869, when the total death-rate had fallen to 24 per 1000 inhabitants, that of phthisis had come to be 20 per cent. of the total, or the comparatively excessive fraction of one-fifth. In the interior, also, of Brazil, phthisis is very common, more especially in the larger towns. The mountainous region of the Argentine Republic and of Bolivia, like other mountainous regions, forms an exception. Even at Salta, Jujuy, and other places situated no higher than

¹ See Jobim, 'Discurso sobre as molestias . . . do Rio de Janeiro, &c.,' Rio, 1835; Sigaud, 'Du climat et des malad. du Brésil,' Par., 1844, 129, 290; Renda, 'Études . . . sur le Brésil,' Par., 1848, 81; ref. in 'Gaz. méd. de Paris,' 1848, Nr. 31; Rochard, 'Mem. de l'Acad. de méd.,' 1856, xx; Schwarz, 'Zeitschr. der Wien. Aerzte,' 1858, 578; ref. in 'Hygiea,' 1867, Forhandl., 16; Wucherer, 'Arch. de méd. nav.,' 1868, Août, 127, and 'Arch. für klin. Med.,' 1873, xi, 471; Bourel-Roncière, 'Arch. de méd. nav.,' 1872, Juill.; Rey, ib., 1877, Janv., 27, and 'Annal. d'hyg.,' 1878, Sept., 215; Béringer, 'Arch. de méd. nav.,' 1879, Mars, 221.

² Mantegazza, 'Lettere med. sulla America meridionale,' Milano, 1858, i, 14; Fériss, 'Arch. de méd. nav.,' 1879, Oct., 254; ref. in 'Berl. klin. Wochensch.,' 1865, 443 (for Montevideo).

³ Brunel, 'Observations, &c.,' 36; Mantegazza, l. c., 19 (for Buenos Ayres).

⁴ Mantegazza, l. c., p. 285.

1000 to 1200 metres (3000 to 4000 feet), the disease is rare ; it is almost unknown¹ in the capital towns of the provinces of Cochabamba, Chuquisaca, and Potosi at elevations of 2000 metres (6500 feet) and upwards, as well as throughout the whole mountain range of Bolivia. In complete accord with the accounts of its frequency on the east coast of South America, and its considerable increase there within the last thirty or forty years, is the information about its progressive diffusion in the coast-districts of *Chili*,² *Peru*,³ and *Ecuador*.⁴ It is met with not uncommonly also among the deep valleys of the Andes, with a warm and moist climate, and in the forest-region of Peru, even at elevations of 500 metres (1600 feet) ; but the high plateaus are almost entirely free from it.⁵

§ 53. INFLUENCE OF A DAMP CLIMATE WITH GREAT RANGE OF TEMPERATURE.

A glance at the sketch here given in general outline of the distribution of phthisis over the globe does not permit us to doubt that *circumstances of climate* are on the whole of merely subordinate importance for the lines of that distribution ;⁶ that the disease occurs, *cæteris paribus*, in all geographical zones with uniform frequency ; that equatorial and subtropical regions are visited with consumption not less than countries with a temperate or an arctic climate ; that the differences which come out on comparing the amount of

¹ Mantegazza, l. c., ii, 240 ; Guilbert, 'De la phthisie pulmonaire dans ses rapports avec l'altitude et avec les races au Pérou et en Bolivie,' Paris, 1862.

² Ref. in 'Arch. de méd. nav.,' 1864, Août, p. 104 ; Ullersperger in 'Virchow's Arch.,' 1869, vol. 48, p. 501 (based on data in the 'Anal. de la Universidad da Chile') ; Boyd, 'Edin. Med. Journ.,' 1876, Aug., p. 110 ; Martin, 'Die Krankheiten im südlichen Chile,' Berlin, 1885, p. 61.

³ Smith, 'Edin. Med. and Surg. Journ.,' 1842, April, p. 359, and 'Brit. and For. Med.-Chir. Rev.,' 1856, Oct. ; Tschudi, 'Oest. med. Wochenschr.,' 1846, pp. 444, 473, 667 ; Guilbert, l. c. ; ref. in 'Boston Med. and Surg. Journ.,' 1867, Feb., p. 86 ; Lantoin, 'Arch. de méd. nav.,' 1872, Mars, p. 161.

⁴ Ref., ib., 1864, Oct., p. 282 (relating to Guayaquil).

⁵ See Smith, Tschudi, Guilbert, ll. cc., and Gayraud, 'Montpellier Méd.,' 1878, Juill., p. 6 (relating to Quito).

⁶ See Lancereaux, 'Gaz. des hôpit.,' 1878, No. 38 ; Andrew, 'Brit. Med. Journ.,' 1884, April, 657.

the malady in the several parts of a given zone are of the same kind as in all other zones; that in many regions the number of cases has gone up considerably without any corresponding changes in the climate, but under circumstances of another kind to be mentioned in the sequel; and, accordingly, that the notion, which is still prevalent, of a preponderance of the disease in cold or temperate latitudes is just as erroneous as the other opinion which has lately come to the front, that consumption is found with especial frequency in those very regions that have a warm or hot climate.

The mean level of the *temperature*, therefore, has no significance, as will be seen from the facts already given and particularly from the statistics of mortality, for the frequency or rarity of phthisis in any locality. But it exercises a very decided influence on the course of the disease; for, according to nearly all the authorities in tropical countries, including India,¹ Cochin China,² China,³ the Pacific Islands,⁴ the Comoros,⁵ the West Coast of Africa,⁶ the West Indies,⁷ Panama,⁸ Guiana,⁹ Brazil¹⁰ and Peru,¹¹ it runs usually a much more rapid and pernicious course in these countries than in higher latitudes, the removal of the patient from such a climate as speedily as may be being in fact the only sure protection against a rapidly fatal issue.

If the absolute height of the temperature has no determining influence upon the frequency of phthisis in a locality, severe and sudden changes of temperature from day to day have just as little on their own account. Evidence of this is found on a large scale in a number of localities in the more elevated regions of North and South America, which are

¹ Bird, Twining, Huillet, ref. in 'Arch. de méd. nav.,' 1868, Mai, 173; Collier, Maclean, Carsten.

² Linquette, Olivier.

³ Lagarde, ref. in 'Arch. de méd. nav.,' 1866, Juill, 12; Daburquois.

⁴ Ref. in 'Arch. de méd. nav.,' 1864, Decbr., 428, 1865; Oct., 288, 1866 Jan., 22; Charlopin.

⁵ Grenet, Davidson (Madagascar); Deblenne.

⁶ Abelin, Bestion, Quétan (Fernando Po).

⁷ Fossongrives, 'Union méd.,' 1857, Nr. 34.

⁸ Ref. in 'Arch. de méd. nav.,' 1864, Oct., 286.

⁹ Riou-Kérangal.

¹⁰ Wucherer and others.

¹¹ Ref. in 'Arch. de méd. nav.,' 1864, Sept., 188.

little touched by the disease although they are subject to very severe fluctuations of temperature. Thus, Mantegazza says:¹

"A Salta, dove la tisi è rara, vi sono rapidi balzi del caldo al freddo; e voi trovate un clima ancora più balzano in quella parte di Bolivia che va con ragione orgogliosa di avere la tisi fra le malattie più rare. Nel Paraguay la temperatura è molto uniforme e tu trovi un numero maggiore di tubercolosi che a Jujui, dove nello stesso giorno si può sudare e avere di brividi."

And there are accounts to the same effect from Peru, from many places on the eastern slope of the Rocky Mountains, and from the elevated prairies in the Western United States.²

No doubt we have to take into account a fact of importance for the question before us, namely, that all those regions have an absolutely *dry* climate. The circumstances are materially different in the case of a *damp climate* subject to great variation of the temperature,⁴ or, in other words, where there is a high dew-point along with considerable range of the thermometer—circumstances which for obvious reasons come out most decidedly in equatorial and subtropical regions. There are few countries of the world so characterised by uniformity of temperature and comparative dryness of the air as the inland districts of Lower Egypt and the Valley of the Nile in Central and Upper Egypt, regions in which phthisis, according to all observers,³ is very uncommon. On the other hand, as we have already seen, localities on the coast such as Alexandria, Damietta, and Port Said, with a moist climate and great range of temperature, are much subject to the disease. The same relations between the sort of climate and the number of cases are found in the interior districts of Algiers on the one part, and in the coast-belt of

¹ L. c., ii, 241.

² Bradford, 'Notes on the North-West or Valley of the Upper Mississippi,' New York, 1846; Foot, 'U. S. Army Med. Rep.,' 1856, p. 47 (for Wisconsin); Keeney, *ib.*, p. 50 (for Iowa).

³ Concerning the influence of a high degree of atmospheric moisture on the origin of phthisis, see Edwards, 'On the Influence of Physical Agents on Life,' Philad., 1838 (from the French, with annotations); Lee, 'Amer. Journ. of Med. Sc.,' 1857, April, p. 345.

⁴ See note 4 on p. 132. Also Richardson 'Travels in Egypt,' i, 392; Bain, 'Edin. Monthly Journ. of Med.,' 1847, Nov. p. 380.

that country or the other. In India, says Hunter,¹ the localities specially distinguished by dryness of climate (and uniformity of temperature), be they on the plains or among the hills, are least affected by phthisis; and the same relationship may be discovered in Java, in the Gulf States of the American Union,² in Mexico, in Guiana and in many islands of the West Indies. It is a probable conjecture that the way in which the climate affects the amount of the disease is through the particular states of weather (high degree of atmospheric moisture along with great variations of the thermometer) causing catarrhal affections of the bronchial mucous membrane and the after-effects of the same; that the climatic influence, accordingly, is in all probability a real predisposing factor in the development of phthisis. It is from the same point of view that we may explain the beneficial effects of the climatic treatment of consumption, a treatment which consists in withdrawing the subjects of phthisis or those who are threatened with phthisis from these harmful climatic influences.

There will be found in the sequel a discussion of the question whether any causal relation (and, if so, of what kind) exists between the weight of the atmosphere in various regions of the globe and the amount of pulmonary consumption therein.

§ 54. WETNESS OF THE SOIL AS A FACTOR.

As regards the influence which *conditions of soil* have upon the prevalence of phthisis, there are two properties of the ground to be considered, namely, its degree of dampness and its elevation.

The first inquiries upon the proportion of phthisis to the degree of saturation of the soil were made, so far as I know, by Bowditch³ in certain of the New England States (Maine, Connecticut, Massachusetts). They were instigated by the

¹ 'Med. Gazette,' 1850, ii, 367.

² Coolidge, 'U. S. Army Med. Reports,' 1856, p. 338; Gaillard, 'Charleston Med. Journ.,' 1855, Jan. xi, 2; (both contrasting the Atlantic coast of Florida with the interior).

³ 'Med. Communications of the Massachusetts' Med. Soc.,' 1862, vi, p. 2.

discovery that the residents in certain localities, or quarters, or even in certain houses suffered from phthisis in a peculiar degree, while the places around, even those in most immediate proximity, were less affected by the disease or unaffected by it altogether. These inquiries, carried out as they were at various places, served to show that the number of cases was in a direct ratio to the degree of dampness of the soil; that the disease was found to be least prevalent upon dry soil, the draining of the ground having been followed by a decrease in the number of cases; and that it is a matter of absolute indifference whether the saturation of the ground proceeds from one source or another. Subsequent investigations by Milroy¹ on the rate of mortality from phthisis in eight towns of Scotland, brought out the same result, the mortality per 1000 inhabitants, from 1857 to 1861, having been as follows: In Leith 2·06, in Edinburgh 2·98, in Perth 3·10, in Aberdeen 3·32, in Dundee 3·40, in Paisley 3·83, in Glasgow 3·99, and in Greenock 4·00. That ascending scale of mortality in the several towns is in direct ratio to the dampness of their respective soils, Leith and Edinburgh with the lowest figures having the driest soil, while Glasgow and Greenock with most phthisis have the dampest soil. Buchanan,² having had his attention arrested by the fact that a considerable decrease of phthisis had taken place in a number of English towns immediately upon the construction of their sewerage works and before there had been time for house drainage, closing of cesspools and the like to be carried out in detail, was led to study the influence of a damp soil upon the amount of disease; and his inquiry confirmed for England the law arrived at by the writers above mentioned, that consumption is much more common on a wet and impervious soil than upon a dry and pervious one such as sand.

The investigation extended to upwards of fifty districts in the counties of Kent, Surrey and Sussex, which differed little from one another as regards the manner of living of the population or other extrinsic factors, and in all of which the death-rate for one decennial period

¹ 'Seventh Annual Report of the Registrar-General for Scotland,' p. xlvii.

² 'Tenth Report of the Medical Officer of the Privy Council,' 1867, pp. 57—

(1851-60) had been ascertained with the greatest possible accuracy. Buchanan's conclusions were as follows: (1) In these three counties consumption is, generally speaking, less common upon pervious soil than upon impervious; (2) of the residents of these counties, those living upon a high-lying and pervious soil suffer from the disease less than those on a low-lying and impervious soil; (3) on unimpervious soil there is less phthisis when the ground slopes than when it is level; (4) the general rule may be deduced that wetness of soil is a cause of phthisis to the population living upon it; (5) after a careful examination of all the observed facts, no other circumstance can be detected that coincides on any large scale with the greater or less prevalence of phthisis except the one condition of soil.

Of recent years, so far as I am aware, there has been no repetition of exact inquiries of that sort on this question. Several writers, however, are of opinion that they have found confirmation, in the experience of their own localities, of the law worked out by these investigators. Thus, Elliot conjectures that the cause of the enormous prevalence of consumption in New Orleans is to be looked for in the influence exercised by a soil saturated with moisture ("the water-level in the soil is coincident with the surface of the soil"). In a like sense Herrmann accounts for the somewhat heavy mortality from phthisis in St. Petersburg; Reeves thinks that the remarkable increase of consumption in Melbourne can be explained by the extensive irrigation lately introduced in the vicinity of the town; Devergie holds that the high death-rate from phthisis in Södermanland, particularly in the basin of Lake Mälär, while it is in part due to the great poverty of the district, is partly to be attributed to the wetness of the whole valley, the subsoil being for the most part glacial clay, which induces a high level of the ground-water, slow subsidence of the rain-water, fogs, and dampness of dwellings; and he certainly finds support for that opinion in the fact that in all the provinces south of the Dal-elf, in which the deaths from consumption reach the average or exceed it, the subsoil is glacial clay with stratified marl or stratified clay, whereas the parts of the country that have a small phthisis-mortality rest upon rock or pervious gravel.

Noteworthy as these facts must always be, it cannot be overlooked at the same time that the rule deduced from them admits of considerable exceptions. Buchanan himself

had to admit exceptional cases, for example that of Ashby-de-la-Zouch, where the mortality from phthisis rose 19 per cent. after the ground was drained. It was subsequently pointed out by Pearse¹ that in several districts of Devonshire where the rainfall was very considerable, the deaths from consumption were comparatively few; and that, if it were contended that these districts were on a pervious soil and that other districts on wet clay showed a far more unfavorable death-rate, it was still a very remarkable thing that the mortality from phthisis was less at Wisbeach in the fen district than at Axminster on the red sandstone, in which part of Devonshire, as well as in others equally fortunate in their geological foundations, but with lace-making as the industry, consumption was more common among the women (who followed that occupation amidst bad ventilation) than among the men; while under hygienic circumstances that are as good as these are bad, as for instance on Dartmoor, the mortality from phthisis is very much less. Further, it is pointed out by Droeze² for Holland, that phthisis is far from taking a prominent place in the mortality, despite the extreme wetness of the soil everywhere; that no definite relationship can be made out with the more or less considerable wetness of the ground on comparing the mortality in the various Dutch provinces; that in fact the more elevated provinces with diluvial soil suffer more than the deep depressions with an alluvial soil, such as Zeeland, which has the smallest phthisical death-rate (1.87 per 1000 inhabitants). According to Reck,³ the mortality from consumption in Brunswick has not been greater in the wet parts of the town than in the quarters on a dry soil. In Danzig, where a system of main drainage was carried out fully in 1871, the death-rate from phthisis, which had been (according to Lievin)⁴ 2.12 per 1000 in the eight years preceding (1863-70), rose in the nine years following (1871-79) to 2.48 per 1000. That the ground was drained by the system of sewers is beyond all question, and yet the amount of phthisis not only did not fall thereupon, but went up 17 per cent; so that

¹ 'Lancet,' 1876, Dec., p. 833.

² L. c., p. 57.

³ Quoted by Schloekow, L. c., p. 262.

⁴ 'Ueber die Sterblichkeit in Danzig in den Jahren 1863-79.'

Lievin concludes: "According to Danzig experience, any connexion between the prevalence of consumption and main drainage, as affecting the sub-soil water, is certainly not made out." At Berlin in like manner no notable effect on the prevalence of phthisis can be traced to drainage of the ground following the canalisation of the city. Previous to 1875, in which year the canalisation began, the mortality from phthisis per 1000 inhabitants was 3·6, 3·7, 4·3, 3·8, 3·4, 3·3, and 3·5 in the successive years from 1869 to 1875. Subsequent to the latter year the annual averages were 3·3, 3·3, 3·5, 3·5, 3·3, 3·3, 3·5, and 3·5 successively from 1876 to 1884. It is Buchanan's opinion that the exceptions to the rule worked out by him are not to be explained by errors in the observations, but that they indicate the presence of other influences in the subsoil, which have hitherto escaped detection. It seems to me to be a more probable explanation that other ætiological factors beside the influence of soil come into the account under the given circumstances, factors that have a modifying effect upon the amount of the sickness, and serve to neutralise the benefits even of the most favorable conditions of soil.

§ 55. RELATIVE IMMUNITY OF GREAT ALTITUDES; THEORY OF THE SAME.

Neither are those other factors to be left out of our view when we come to judge of the facts that have been adduced for and against the influence of *altitude* upon the prevalence of phthisis in a locality, and have lately been assigned a practical importance, which is, in my opinion, not altogether warranted. The observations published by Archibald Smith and Tschudi as to the extreme rarity of phthisis on the high plateaus of the Andes in Peru, and as to the good effects upon the phthisical of a residence thereon, were the first statements to direct general attention to the comparative immunity from consumption of regions at a great elevation. Further inquiries in the same direction have confirmed the general fact;¹ but they have in part also given colour to an

¹ "There is no doubt," says Andrew, "that, as regards altitude, the prevalence

opposite conclusion, so that the question may be said to be still a *lis sub judice* for those who would decide it absolutely and without regard to accessory circumstances.

It is not to be denied that phthisis does occur at the highest inhabited spots on the globe, and that it is rare in many places situated on low plains. None the less is it an incontestable fact that consumption is, *cæteris paribus*, much less frequently met with at high-lying places than in those at a lower elevation or on the sea-level. Not only so, but the number of cases stands in some kind of definite proportion to the degree of elevation; while the exceptions to the general rule find satisfactory explanation in other etiological factors coming into play at the same time.

The rarity of phthisis at high elevations comes out on the great scale in the returns of sickness from that most extensive of the earth's mountain-chains which runs along the whole Pacific coast of the Western Hemisphere. For the Rocky Mountains of North America we have evidence¹ of the fact from a number of places in the territories situated towards the southern end of the range, such as New Mexico, Arizona, Colorado, and also Utah. In like manner all the authorities² speak of the rarity of the disease on the plateaus and mountain-slopes of Mexico, Guatemala, Salvador,³ Costa Rica,⁴ and Panama (for example on the Cordilleras of Veragua and Chiriqui⁵). From Bogota in New Granada, Holten⁶ writes that he did not see one consumptive person in the hospitals of the town during a prolonged residence there. Referring to Quito (Ecuador), Gayraud and Domec say:⁷ "Notre expérience personnelle nous permet d'affirmer, que la phthisie y est tellement rare qu' on peut dire qu' elle n' y existe pas, au moins comme maladie prenant naissance dans

of phthisis at considerable heights, although instances of it do exist, is exceptional" ('Brit. Med. Journ.,' 1884, l. c.).

¹ Bartholow, l. c.; Denison, 'Trans. Amer. Med. Assoc.,' 1879, xxx, 155; Tyndall, 'Influence of Altitudes on Consumptives,' St. Louis, 1879.

² Ref. in 'Brit. Med. Journ.,' Feb., 1867, p. 86; Jourdanet, l. c., Poncet, l. c. Burkhart mentions that he had not seen a single case of phthisis during a period of three months among the Europeans occupied at the mines in Mexico.

³ Guzman, l. c.

⁴ Wagner and Scherzer, l. c.

⁵ Wagner.

⁶ 'New Granada: Twenty Months in the Andes,' New York, 1857.

⁷ 'Montpellier Medical,' 1878, Juill., p. 2.

le pays lui-même. . . . Le fait est donc pour nous indubitable—on ne devient pas phthisique à Quito.” For the Peruvian Andes we have the statements of Smith and Tschudi already mentioned; during a year’s stay on the Cerro Pasco the former saw only one case of consumption, and that was in a woman who had come from Europe.¹ In those parts of the Argentine Republic that are within the limits of the Andes, the influence of high elevations upon the rarity of phthisis is observable as far down as Salta; it is still more obvious in the elevated valleys on the western side,² as well as on the Bolivian plateau, at Chuquisaca, Cochabamba, Potosi, and other places.³ In the mountainous parts of Guiana also consumption is almost unknown.⁴

In the Eastern Hemisphere this immunity from phthisis comes out most decidedly on the plateau of Armenia, where the disease is found almost solely among those who have come from less elevated places;⁵ also on the table-land of Persia, where it is extremely rare, and among the natives of the country almost unknown;⁶ on the northern and southern slopes of the Himalaya,⁷ at the elevated points of the Western Ghâts, on the Nilghiri Hills,⁸ on Mount Abu⁹ (4000 feet) in the Arawalli range, and in Nearer India; on the plateau of Abyssinia¹⁰ and on those of Southern Africa.¹¹

In Europe a certain rarity of phthisis begins to be noticeable even at comparatively small elevations, as in the Iser range¹² and on the northern spurs of the Carpathians in Upper Silesia, on the elevated plain of Thuringia,¹³ in the Upper Harz, and in the Spessart. Writing of Upper Silesia, Virchow says:¹⁴ “Although I have seen an exceptionally

¹ Edin. Med. and Surg. Journ., 1842, April, p. 359.

² Mantegazza, l. c., ii, 209.

³ Ib., p. 240; Guilbert.

⁴ Hancock, Laure, ll. cc.

⁵ Wagner.

⁶ Polack, ‘Wien. med. Wochenschr.’ 1855, No. 17, and ‘Zeitschr. der Wien. Aerzte,’ 1859, p. 140.

⁷ Schlagintweit, Hooker, Curran, ll. cc.

⁸ Young, ‘Transact. of the Calcutta Med. Soc.’ 1829, iv, 36; Hooker; Gibson, ‘Transact. of the Bombay Med. Soc.’ 1839, ii, 200; Hunter, ‘Lond. Med. Gaz.’ 1850, ii, 367.

⁹ Lowndes, ‘Transact. of the Bombay Med. Soc.’ 1857, n. s., iii, 175.

¹⁰ Griesinger, Blanc.

¹¹ Fritsch.

¹² Adam, ‘Breslauer ärztl. Zeitschr.’ 1884, Nr. 17, 18.

¹³ Lübken, ‘Die Krankheiten Thüringens,’ Strassb., 1880, 48.

¹⁴ ‘Arch. für pathol. Anat.’ 1849, ii, 170.

large number of sick persons of the poorer class both in town and country, at their homes and in hospital, yet there has not come under my notice a single case of phthisis; and the statements of the medical men bear out the notion that the disease is rare." In the Upper Harz consumption is so unusual that Brockmann,¹ during a practice of many years and extending to 80,000 sick persons, found only 23 phthisical patients of whom only 14 had been born in the Upper Harz; in the lower valleys the malady is more common, but the high plateau is almost exempt. In the Spessart,² according to Virchow, phthisis is at all events rare; in the larger villages he met with only an occasional case, while the registers of deaths rarely contained the entry of consumption or decline. I shall add here the interesting note by Gross,³ that consumption is almost unknown in Briançon (Hautes Alpes), the most elevated town in Europe (1306 metres or 4285 feet), although the place is a small fortress with a good deal of filth and a number of industries.

Statistical inquiries, such as have been carried out in Saxony, Baden, and Switzerland, on the amount of phthisis at elevated places as compared with low-lying places close at hand (due regard being had to any differences in the mode of life) have confirmed that law of immunity of the more elevated places from phthisis which had been deduced from the study of the higher elevations by themselves. The following is Merbach's⁴ table for Saxony, based on a period of three years, from 1873 to 1875, and including only those towns with upwards of 5000 inhabitants and only the ages between 14 and 60.

Altitude in metres (= 3½ feet.)	Deaths from phthisis per 1000 within the limit of age.
100 to 200	... 4'9
200 to 300	... 3'3
300 to 400	... 3'2
400 to 500	... 3'5
550 to 650	... 3'3

¹ *Hannov. Annal. für die Heilkde.*, 1843, N. F., iii, 507.

² *Verhandl. der Würzb. phys.-med. Gesellsch.*, 1852, iii, 128.

³ *Journal de la Société de statistique de Paris*, 1857.

⁴ *Jahresber. des königl. sächs. Landes-Medicinal-Colleg. für das Jahr 1876*,

Merbach concludes as follows : " There is certainly nothing shown here of any marked influence due to the elevation of the various localities, or of such an influence as would cause the number of deaths from phthisis to decrease *pari passu* with the increase in elevation. A result of that sort was indeed not to be looked for, inasmuch as the several towns are subject to other influences, and some of them noxious ones, such as the occupation of the inhabitants, the density of the population and the like, which are capable of neutralising the good effect of an elevated location. At the same time even in the instances before us the good effects (otherwise sufficiently proved) of a high situation upon the prevalence of consumption can hardly be overlooked whenever we begin to compare the villages in the lowest situation with those in the highest. . . . The contrast comes out with special clearness when the averages calculated for towns situated at one and the same level are compared together."

Corval¹ has worked out this relationship from the Baden bills of mortality over a period of four years (1869-72), including in his total, as he was bound to do, all those cases where the cause of death was given as "tuberculosis," "chronic pneumonia," or "phthisis." He distinguishes six groups of localities according to elevation :

Table of Mortality from Phthisis in Baden according to Elevation.

	Elevation in feet.	Number of towns or villages.	Population (average of 4 years).	Deaths from phthisis per 1000.
I	330—1000	750	933,773	3'36
II	1000—1500	337	224,210	2'75
III	1500—2000	160	81,066	2'60
IV	2000—2500	190	104,289	2'75
V	2500—3000	97	59,155	2'33
VI	Above 3000	47	20,367	2'17

In order to ascertain what effect is produced upon the death-rate from phthisis by density of population, industrial pursuits and other things peculiar to towns, we may make a

¹ 'Vierteljahrschr. für öffentl. Gesundheitspflege,' 1874, vi, 51.

calculation of the mortality according to the size of every town or village in Baden, using Corval's figures;¹ we shall find, accordingly, that it is 3·12 per 1000 inhabitants for the whole of Baden, 3·00 for villages of 3000 and under, 3·49 for towns from 3000 to 10,000, and 4·56 for towns with more than 10,000 inhabitants. If, now, we arrange the places that are respectively over and under 3000 population in two columns, classifying them in the six groups according to elevation, we shall get the following table of the death-rate from phthisis :

Altitude groups.	Under 3000 population.	Over 3000 population.
I	3·11	4·05
II	2·73	3·08
III	2·49	4·99
IV	2·71	4·72
V	2·29	3·06
VI	2·17	—

In the series with less than 3000 inhabitants the favorable influence of increasing elevation is quite obvious ; but in the second column of death-rates it will be seen that the benefit is in some circumstances more or less neutralised by detrimental factors belonging to the social and industrial life of the larger centres, or the towns. Still, from the facts such as they are, we may adopt Corval's conclusion that "cases of phthisis decrease with increasing elevation; or, in other words, in mere increase of altitude we may discover one of the most important factors in checking the development of consumption."

Müller's inquiries² into the effect of elevation upon the prevalence of phthisis in Switzerland have led him to the same conclusion ; although the results, as he is careful to explain, can be said to be only approximately correct, for the reason that the data at his service were not free from a good many omissions and errors. He distinguishes three

¹ I have taken the calculations from Schlockow's work.

² 'Die Verbreitung der Lungenschwindsucht in der Schweiz,' Winterthur, 1876.

groups of places: (1) those in which 43 to 63 per cent. of the inhabitants follow some industrial occupation (cantons of Outer Appenzell, Glarus, Neuchatel, town and country divisions of Basel, and Geneva); (2) where the industrial part of the population reaches from 31 to 43 per cent. (cantons of Zurich, St. Gall, Thurgau, Zug, Inner Appenzell, Aargau, Schaffhausen, Solothurn, Bern, Ticino); and (3) the agricultural cantons where the industrial population is only 13 to 26 per cent. (Lucerne, Schwyz, Unterwalden, Vaud, Freiburg, Grisons, Uri, Valais). Grouping the places in each of these divisions according to their elevation within a limit of 200 to 1800 metres (650 to 6000 feet), we get the following table of death-rates:

Table of Death-rates from Phthisis in Swiss Towns and Villages.

Elevation (in metres).	Industrial cantons.	Mixed cantons.	Agricultural cantons.	Average.
200—500	2.7	1.85	1.4	2.15
500—700	3.0	1.55	1.2	1.9
700—900	1.35	1.7	0.7	1.0
900—1100	1.5	1.9	1.9	1.2
1100—1300	2.3	2.3	0.7	1.9
1300—1500	—	1.4	0.6	0.8
1500—1800	—	1.3	0.7	1.1
Average . .	2.55	1.7	1.1	1.86

Müller concludes (*loc. cit.* p. 81) from these facts that in Switzerland consumption can be shown to decrease as we ascend; that the malady does occur, although rarely, at the highest inhabited spots; that the lowest localities have on the average about twice as many consumptives as the highest, and very much more than that if cases where the phthisis had been acquired elsewhere be subtracted; that the decrease of phthisis with ascending elevation is, however, neither constant nor proportionate; and that the irregularities and fluctuations which are noticeable are owing mostly to the position in the social scale, inasmuch as the industrial groups of places show the irregularities most, and the mixed groups

on the whole a regular decrease with height, while the agricultural groups touch their lowest death-rate at a comparatively small elevation.

What the minimum of elevation is that a locality must have before it feels the good effects of altitude on the prevalence of consumption, is a question that cannot be answered with certainty from the facts before us. Gastaldi¹ puts it at 600 to 1000 metres (2000 to 3300 feet); it seems to me, however, that a notable decrease in the disease can be shown to occur at as small an elevation as 400 or 500 metres (1500 feet), provided other circumstances are favorable. But any immunity from phthisis due to the height of the place does not come out decidedly until we go to elevations so great as to be uninhabitable in temperate climates like that of Europe. We must go to the equatorial parts of the world to study the sanatory effects of altitudes ranging from 2000 to 3000 metres (6000 to 10,000 feet); and, inasmuch as the question is one of populous places and the seats of industry, we must take the large towns on the plateaus of the Andes in Central and South America, such as Puebla with 80,000 inhabitants and at an elevation of 2300 metres or 7500 feet, Mexico (320,000 inhabitants, 7500 feet), Quito (60,000 inhabitants, 9300 feet), Bogota (40,000 inhabitants, 8500 feet), Chuquisaca (25,000 inhabitants, 9800 feet), Cochabamba (40,000 inhabitants, 11,000 feet) and Potosi (20,000 inhabitants, 13,000 feet). In all of these, which are to some extent industrial towns, or at any rate much occupied with trade and commerce, and by no means models of good sanitation, consumption, according to the unanimous testimony, is either rare or, among the natives, it does not occur at all. And that is a proof that the influences which go with very considerable altitude have the power to overcome those detrimental things that arise from a bad kind of hygiene and social life, in so far as these tend to produce consumption.

Opinions differ as to the nature of the influence of altitude. Some trace it to the air being free from decomposition-products, dust and the like; others to the dryness of the air and of the soil: both of which opinions seem to me to be overthrown by the facts above given, as well as by the

¹ 'Gaz. med. die Stati Sardi,' 1858, No. 18.

circumstance that the immunity from consumption occurs equally on dry plains and on damp, or in mountain valleys abounding in lakes and pools, provided only that they stand at a considerable elevation. The only explanation that I can offer, and one to which I shall hold until something more satisfactory presents itself, is that people who have been born and brought up at great elevations have been always under the necessity of making frequent (or perhaps deep) inspirations as a consequence of breathing a rarefied atmosphere, that they are continually practising a kind of pulmonary gymnastics, from which there proceeds a vigorous development of the breathing organs and a greater power of resistance on their part to noxious influences from without. "After looking at the bustle of traffic in towns like Bogota, Micuipampa, Potosi and such like, at elevations of 8000 to 12,000 feet," says Boussaingault, "after witnessing the strength and marvellous skill of the toreadors in the bull-fights at Quito, 9000 feet above the sea-level; after seeing young and delicate girls dancing a whole night at places almost as high as Mont Blanc, on which the celebrated Saussure had hardly strength enough to use his instruments of observation and his hardy guides fell down in a swoon as they proceeded to dig a hole in the snow; when we remember, finally, that a famous battle, that of Pichincha, was won almost in the altitude of Monte Rosa—I think that you will agree with me that man can become adapted to breathing the rarefied air of the very highest mountains." I will readily grant that many of the accounts of embarrassed breathing experienced by natives of the plains on ascending very high mountains are exaggerated; and I must confess that in my own case, after resting for a short time at elevations of 10,000 feet and upwards, I was conscious of no considerable want of breath, or did not become aware, at least, of any need for quicker and deeper inspirations. At the same time it is not to be denied that the atmosphere at elevations of 10,000 feet, especially in a warm climate, is rarefied to the extent of more than one-third of its volume at the sea-level. The quantity of oxygen contained in it is therefore considerably diminished, and a man must take in a larger quantity of air in a given time, or must inspire oftener than on

the plains, so as to cover his requirements for oxygen. To that assumption no well-grounded objection can be raised, whether from the side of physics or of physiology; and there is equally little reason why we should not assume that those who have been born and have lived all their lives under such circumstances will have had their breathing organs powerfully developed. I do not hesitate, therefore, to discover the reason of the immunity from phthisis enjoyed by the residents of elevated places, in the influence which a continuous residence in a rarefied atmosphere exercises over them.

§ 56. MORE OF IT IN A CROWDED POPULATION.

Differences in the *social, hygienic, commercial and industrial conditions* of various parts of the world have a real import for the more or less frequent occurrence of phthisis therein. This is shown in the first instance by the distribution of the malady respectively in *town and country*, in large populous towns and in those that are small or thinly populated, and among a stationary or a nomadic population. As a general rule phthisis is commoner in towns than in the open country, and rarer in small towns than in large; or, in other words, it is found in greater diffusion the more crowded the population.

In England, according to the statistics of mortality from 1859 to 1869, the lowest death-rates from phthisis (1·8 to 2·2 per 1000) are found in the counties most given up to agriculture and pasture, and with few large towns: such as Rutland, Worcester, Wilts, Dorset, Somerset, Herts, Bucks, Hereford, Gloucester, Shropshire and Lincoln; while the highest death-rates (2·7 to 3·3 per 1000) occur in the counties with many places of manufacture and trade, the centres of industry and commerce: such as Notts, Derby, West and East Ridings, Durham, Northumberland, Cheshire, Lancashire and the metropolis. For Denmark the following ratios of death from phthisis have been calculated by Lehmann from the statistics of 1876-83: in Copenhagen, 3·00 per 1000; in the five largest provincial towns, mostly engaged in trade, shipping and manufacture, and with populations from

12,700 to 25,000, 2·63 per 1000 ; in twenty-four towns, with from 3100 to 9000 inhabitants, agricultural in the first place but also concerned in trade, manufacture and handicrafts, 2·27 per 1000 ; in the thirty-five smallest towns, with from 700 to 2900 inhabitants, mostly agricultural but also occupied with fishing and shipping, 2·12 per 1000. In Holland, according to Fokker,¹ the death-rate from phthisis in the towns is to that in the open country as 21 to 16. Summing up his statistical inquiries on the mortality for the years 1866-75, Droeze² says: "In nearly every group of places in the most diverse provinces of Holland the death-rate from phthisis was greater in the towns than in the country parishes."

The following table, from Schlockow's³ figures, shows the mortality from phthisis in town and country in the several administrative divisions of Prussia :

*Mortality from Phthisis in Town and Country per 1000
Inhabitants (Prussia).*

	Town.	Country.		Town.	Country.
Königsberg .	2·49	1·45	Hanover .	3·38	4·44
Gumbinnen .	2·77	1·84	Hildesheim .	2·66	3·21
Danzig .	2·39	1·41	Lüneburg .	3·85	3·39
Marienwerder .	2·54	1·35	Stade .	3·18	4·20
Potsdam .	2·88	2·33	Osnabrück .	4·87	5·22
Frankfurt .	3·08	2·25	Aurich .	3·31	3·79
Stettin .	2·90	2·08	Münster .	6·50	4·70
Köslin .	2·58	1·60	Minden .	4·73	4·90
Stralsund .	3·21	2·12	Arnsberg .	5·46	4·51
Posen .	2·96	2·04	Cassel .	3·48	3·03
Bromberg .	3·13	1·85	Wiesbaden .	3·82	4·08
Breslau .	3·73	2·75	Coblenz .	4·26	4·35
Liegnitz .	2·98	2·35	Düsseldorf .	5·22	5·29
Oppeln .	2·99	2·45	Cologne .	4·76	5·34
Magdeburg .	2·98	2·65	Treves .	3·53	3·56
Merseburg .	2·63	2·16	Aix .	3·64	4·59
Erfurt .	2·69	2·70	Sigmaringen .	3·11	3·63
Schleswig .	3·31	3·18			

¹ 'Weekblad van het Nederl. Tijdschr. voor Geneesk,' 1875, No. 9.

² L. c., p. 61.

³ L. c., p. 267.

In Baden¹ from 1852-71, the death-rates from phthisis group themselves as follows :

Villages or towns.	Population.	Deaths from phthisis per 1000.
95	100—500	2·3
92	500—1000	2·6
53	1000—2000	3·0
17	2000—4000	3·4
3	4000—8000	3·5
3	17,000—31,000	3·9

In the Bavarian administrative section of Middle Franconia Majer estimates the proportion of deaths from phthisis between town and country at 100 to 61. In the arrondissement of Dax (Dep. Landes) consumption is hardly known among the rural population, but it is far from rare in the towns;² and the same fact is recorded of the arrondissement of Nérac³ (Dep. Lot-Garonne). In the course of inquiries upon the antagonism between phthisis and malarial diseases in Ferrara and vicinity, Bosi and Gambari⁴ came to the conclusion that phthisis was rare among the rural population at those places where malarial fevers were endemic; that it was more common in the villages with a rather crowded population; and that it was very prevalent in the large towns. They found the same proportions also in those parts of the country where malarial fever was merely sporadic; in other words, the density of the population was, *ceteris paribus*, decisive for consumption. It is very significant for the question before us, as already indicated more than once, that nomadic peoples enjoy an almost complete freedom from phthisis; this holds good for the Kirghiz hordes of the Russian steppes, for the Arab tribes in Kabylia and other parts of Northern Africa, and for those of Nearer Asia. The disease is met with oftenest, says Pruner, among those Bedouin families "who have exchanged the tent for the dwelling built of stone."

¹ Schweig, 'Aerztl. Mittheil. aus Baden,' 1875, No. 17, p. 148.

² Lavielle, 'Topogr. méd. et stat. des cantons de Dax (Landes),' Paris, 1879, p. 115.

³ Mondineau, 'Pathogénie et l'hyg. de l'arrond. de Nérac,' Paris, 1867, p. 23.

⁴ 'Giornale per servire ai progressi della patologia,' 1847, Oct.

§ 57. INCREASE OF PHTHISIS IN THE URBAN POPULATION OF THE UNITED STATES.

Another interesting proof of the influence exercised upon the amount of phthisis by the social factors is afforded us in the disease increasing as a result of extensive *immigration* and the consequent *founding of new towns, or enlargement and crowding of old ones*. Observations of that kind come mostly from the New World, and more particularly from the Northern and Central States of the American Union since the beginning of the present century.

Writing in the last century, Rush says:¹ "Phthisis is scarcely known by those citizens of the United States who live in the first stage of civilised life and who have lately obtained the title of the first settlers; it is less common in country places than in cities, and increases in both with intemperance and sedentary modes of life." Since that was written the disease has increased considerably, not only in the Eastern States but also in the Western, along with the founding of cities and the rise of traffic and industry.² Writing in 1828 of the western counties of Pennsylvania, Callaghan³ says that "phthisis is increasing among the sedentary population of our towns with fearful strides;" and for a more recent period there are accounts from that State,⁴ as well as from California,⁵ of the disease increasing hand in hand with progressive immigration and additions to the population of the towns. Still more recently Davis⁶ has written of the Western States as follows: "Close buildings and increased aggregation of population are increasing the prevalence of pulmonary tuberculosis in our country at an alarming rate In still earlier days, dating back to the early settlements of this country, New England and the North Eastern States were as free from consumption as are now the much vaunted far-western States and Territories. It was immediately consequent upon the change from an agricultural to a manufacturing population that the rapid increase in the death-rate from consumption is apparent in these States. Fifteen or twenty years ago Indiana, Illinois and the Lake region were the

¹ 'Med. Inquiries and Observations,' Philad., 1789, p. 159.

² See Hildreth's account for Ohio ('Amer. Journ. of Med. Sc.,' 1830, Feb., p. 326).

³ *Ib.*, 1828, Nov., p. 366.

⁴ Stanton, 'Trans. Pennsylv. State Med. Soc.,' 1859 (for Beaver County); Anderson, *ib.*, 1860 (Indiana County).

⁵ Gibbons, 'Trans. San Francisco Med. Soc.,' 1857.

⁶ 'Trans. Amer. Med. Assoc.,' 1878, xxix, 149.

favourite resorts for consumptive patients Now we have a constantly increasing proportion of cases originating in this same region, not evidently from any change that has taken place in the climatic conditions, but, as before stated, from the change in the occupation and hygienic surroundings of the people."

§ 58. INFLUENCE OF IN-DOOR OCCUPATIONS ; THE PHTHISIS OF BARRACKS AND PRISONS.

The exceedingly common occurrence of phthisis among the new arrivals themselves is in part the explanation of the progressive increase of phthisis in the cities of the United States that goes on hand in hand with immigration on a large scale. But a not less considerable part of it is due to an increase of the malady among the settled population of the towns. It must be connected, therefore, with influences of a general kind proceeding from a change in the mode of living within the current century and particularly within the more recent years of it—with *social errors* such as mostly obtain in large towns and in the centres of industrial traffic, errors from which no city or manufacturing town can escape. Among those detrimental things in the social life we have, according to nearly unanimous opinion, to assign the first place, along with insufficient or bad food,¹ to the *bad domestic hygiene*, to the influence of continuous residence in crowded living-rooms and work-rooms, tainted with organic and

¹ Wucherer ('Arch. für klin. Med.' 1873, xi, 477), in his estimate of the causes that have led to an increase of phthisis in Brazil within the last forty or fifty years, lays special stress, after allowing for the progressive crowding of the towns, upon the fact that the means of subsistence have become worse and worse. As a general rule, he says, work is harder in Brazil now than formerly, the wages less for doing it, and the scale of living poorer. Wages have not gone up in proportion to the increasing dearness of the necessities of life, and the quality of the diet has deteriorated. With reference to the decrease of phthisis in the Würtemberg convict prisons, Cless gives the following noteworthy fact ('Vierteljahrsschr. für öffentl. Gesundheitspflege,' 1879, xi, 396): The death-rate from consumption among the prisoners from 1850 to 1859 was 24 per 1000; from 1859 to 1876 it fell to 8 per 1000, and that, as far as appeared, solely in consequence of introducing a better and adequate diet. There was not the slightest difference made in any other conditions which could be looked upon as factors in the disease.

inorganic exuviae, ill ventilated and damp. In fact it would be hard to find any factor in the production of phthisis which can claim more importance than that.

"The effect of sedentary habits," says Clark,¹ "in all classes and conditions of society, is in my opinion most pernicious, and there is perhaps no cause, not even excepting hereditary predisposition, which exerts such a decided influence in the production of consumption as the privation of fresh air and exercise; indeed the result of my inquiries leads to the conviction that sedentary habits are among the most powerful causes of tuberculous diseases, and that they operate in the higher classes as the principal cause of its greater frequency among females." "All modes of life," says Andrew,² referring to the origin of phthisis, "all occupations which are carried on indoors, contrast unfavorably with outdoor pursuits. The naked savage, whatever ills he may have to bear, rarely finds phthisis among them; but with every addition to his clothing, and to the comfort of his tree or cave, his proneness to it increases." Flint³ sums up his many years' experience of hospital and private practice as follows: "The general conclusion is that occupation has an agency in the etiology of pulmonary tuberculosis, in so far as it is sedentary and involves confinement within doors. If it be said that this conclusion is in accordance with what is already known, I answer that the correctness of the conclusion is thereby made the more certain."

This it is, in my opinion, that furnishes an easy and rational explanation of the differences in the amount of the disease in town and country, and of its increase at certain places along with the development of industry in the same. But the influence of that etiological factor upon the genesis of consumption comes out most prominently in the conditions of sickness among those groups of the population that are especially subjected to the detriment in question, such as factory hands and those engaged in various trades, whose occupation makes it necessary for them to spend most of their time indoors.

I must content myself with quoting two or three of the more noteworthy among the truly overpowering mass of observations on this point that have been made in various parts of the world, and have passed into general currency.

Summing up Greenhow's inquiries, which were based in

¹ Sir James Clark, 'Treatise on Pulmonary Consumption,' Lond., 1835, p. 201.

² 'Brit. Med. Journ.,' 1884, April, p. 707.

³ 'New York Med. Record,' 1873, Jan., p. 49.

part on official statistics of the mortality,¹ and in part on independent local researches² into the death-rate from consumption in the manufacturing districts of England, Simon concludes as follows:³

"In proportion as the male and female populations are severally attracted to indoor branches of industry, in such proportion, other things being equal, their respective death-rates by lung disease increased . . . and this further conclusive proof was given as to the influence of an accused occupation, viz. that the high death-rate from lung disease belonged, according to the occupation, to men or to women of the district, that it sometimes was nearly twice as high for the employed sex as for the unemployed sex, and that it only extended to both sexes where both were engaged in the occupation."

Smith⁴ has ascertained for one thousand persons treated for consumption at the Brompton Hospital, that seventy per cent. of them had been in the habit of spending their time in overcrowded, hot and dusty places indoors. Finkelnburg's⁵ summary of his inquiries into the causes of mortality in Rhenish Prussia is as follows:—"The victims of pulmonary phthisis are the more numerous the more generally are indoor occupations followed by the one sex or the other, especially when the materials of their work are such as to create dust; wool-carding and spinning, knife-grinding and metal-polishing are the most pernicious. Wherever these occupations are found among the rural population as well, there also the mortality from phthisis reaches a high figure, although never so high as in towns with the same industries." From the paper of Schweig⁶ on the distribution of phthisis in Baden, it appears that the mortality from it is in proportion to the density of the population, as well as to the more or less industrial character of each locality, the smallest communities being mostly engaged in agriculture, while the larger villages and large towns are occupied with industrial pursuits. The result is the same as that come to by Corval, as we have already seen in detailing his investigations into the influence of altitude upon the prevalence of the disease.

¹ 'First Report of the Medical Officer of the Privy Council,' 1858.

² 'Third Report,' &c., 1860, 102—194.

³ 'Third Report,' 30, 34.

⁴ 'Lond. Med. Times and Gaz.,' 1862, April.

⁵ 'Centralblatt für allgemeine Gesundheitspflege,' 1882, i, 14.

⁶ 'Aerztli. Mittheil. aus Baden,' xxix, 1875, Nr. 17.

Kolb¹ shows from the statistics of Bavarian hospitals for 1877 and 1878 that "consumption in Bavaria is commonest in the highly industrial region of Central Franconia, where the influence of manufactures has been at work for generations." In Müller's² inquiries into the state of health in Switzerland, he divides the country into agricultural, industrial and mixed sections (the last being partly devoted to farming and partly to manufacture); and he finds that the phthisical death-rate of the industrial group stands to that of the agricultural in the ratio of 69·8 to 30·2, of the industrial to that of the mixed in the ratio of 53·8 to 46·2, and of the mixed to that of the agricultural in the ratio of 66·5 to 33·5. The general law deduced from his research is that the mortality from phthisis in the industrial circles is on the average more than double that in the agricultural. The actual figures are 2·55 per 1000 in the industrial localities, 1·7 in the mixed, and 1·1 in the agricultural, giving a proportion of 47·7 to 31·8 to 20·8. In Belgium, according to Meyne (*l. c.*) the highest proportion of deaths from phthisis falls to the industrial divisions of the country. From a paper by Chatin³ it appears that the amount of phthisis among the factory hands in Lyons is altogether enormous: it is greater than in any other part of France or in any other country, the mortality from it having amounted in 1866 to 33 per cent. of the deaths from all causes at the Hôpital de la Croix-Rousse. This fact is confirmed by Fonteret,⁴ who says that the female part of the working class suffers more than the male, for the reason that the women are more subject than the men to the noxious influences (sedentary indoor life in factories). Poulet⁵ calls attention to the fact that in the village of Plancher-les-Mines (Arrond. Lure, Dep. Haute-Saône), where the people until about thirty years ago were occupied with agriculture almost exclusively but have been devoted since that time mostly to industrial pursuits, phthisis now causes 12·5 per cent. of the total mortality, whereas formerly it was very seldom seen. The

¹ *Bayer. ärztl. Intelligenzbl.*, 1883, p. 59.

² *L. c.*, pp. 75, 76.

³ *Gaz. Méd. de Lyon*, 1867, p. 391.

⁴ *Lyon médical*, 1870, Nr. 2.

⁵ *Gaz. méd de Paris*, 1873, 698.

malady is exceedingly common among the Kashmiri weavers in and around Amritsur (Punjaub), who live, as Hinder¹ tells us, crowded together in confined, dark and filthy rooms. Wucherer² says: "L'agglomération de beaucoup d'individus dans les fabriques et les ateliers influe largement sur le développement de la phthisie;" and he adds: "Au Brésil ce sont les fabriques de cigares qui fournissent un fort contingent de phthisiques."

The same circumstances serve to account for the strikingly common occurrence of phthisis in nunneries, seminaries and such-like institutions, in evidence whereof a number of observations have been brought forward by Fourcault;³ also in the Oriental harems, not only among the women but among the children also;⁴ again, among badly lodged troops, of which we have evidence from England, France, Turkey⁵ and India; and, above all, in prisons.

Among army surgeons there is complete agreement that cases of phthisis are least common in soldiers when they are leading an active life in the open air, on the march or in manœuvres and campaigns; and that the cases mount up as soon as the troops enter on their garrison life, as for example in winter, and spend their time in ill-constructed, crowded, filthy and badly ventilated barracks. Welch,⁶ who treats of this matter with reference to the British army, says that "nearly half of army consumption is connected with vitiated barrack atmosphere," a similar opinion having been expressed by earlier writers such as Tulloch⁷ and Maclean,⁸ the latter including in his statement the British and native troops in India.⁹ With respect to its frequency in the French army we find a similar reading of the facts in the

¹ 'Med. Times and Gaz.,' 1854, Sept., 538.

² 'Arch. de méd. nav.,' 1868, Août, 131.

³ 'Causes génér. des maladies chroniques, &c.,' Par., 1844. "Pour préserver l'homme et les animaux des affections tuberculeuses," he says, "il faut les exposer habituellement dans l'état de liberté."

⁴ See Rigler, 'Die Türkei und deren Bewohner,' ii, 239; Pruner, Griesinger, ll. cc.; Burton for Zanzibar.

⁵ See Sandwith, 'Assoc. Med. Journ.,' 1854, May, 435 (giving his observations made in Constantinople).

⁶ 'Nature and Varieties of Lung Disease,' Lond., 1876.

⁷ 'Army Med. Reports,' 1853, p. 15.

⁸ *Ib.*, 1862, p. 442.

⁹ Ewart, 'Brit. Med. Journ.,' 1881, p. 809.

papers by Champouillon,¹ Tholozan,² Viry,³ Lansières,⁴ and others.

"L'augmentation considérable des décès qui pèse sur l'armée en temps de paix," says Tholozan, "est surtout occasionnée par les lésions pulmonaires d'un caractère particulier; les lésions sont l'effet d'un vice spécial, d'une diathèse spécifique de l'économie qui se développe dans des conditions d'encombrement, d'agglomération, de vie en commun, particulières aux casernes."

Phthisis in prisons.—Consumption prevails in prisons to a truly disastrous extent. I take the following statistical data from an excellent article on the subject by Baer:⁵ In United States prisons from 1829 to 1845 the mortality from phthisis was 12·82 per 1000 prisoners at Philadelphia, and at Auburn and Boston 9·89 and 10·78 respectively; in Baltimore prison it was 61 per cent. of the mortality from all causes. In the French prisons, particularly those in which long terms of penal servitude are worked out, the death-rate from phthisis amounts to between 30 and 50 per cent. of the mortality from all causes. In the Dutch prisons it reaches the same height; in the Danish convict prisons it amounted in 1863-69 to 39 per cent. of all the deaths; over the whole of the prisons of the Austrian Empire in 1877-80 it was 61·3 per cent.; and in the nine large convict prisons of Bavaria from 1868 to 1875 it was 38·2 per cent. In the penal establishments of Würtemberg, according to Cless,⁶ the yearly average of deaths from phthisis from 1850 to 1859 was 24 per 1000; while from 1859 to 1876, in consequence of an improved diet, it fell as we have seen⁷ to 8 per 1000, although it still remained two or three times greater than among the people at large. During a period of eleven years (1869-79) the mortality in the prisons of Prussia was 42·87 per cent. of the deaths from all causes, and 12·32 per 1000 prisoners.⁸

¹ 'Gaz. des hôpit.,' 1857, 127.

² 'Gaz. méd. de Paris,' 1859, Nr. 23, 24, 27.

³ 'Journ. de méd. de Bordeaux,' 1870, Juill., 295.

⁴ 'De la phthisie dans l'armée,' Par., 1872, 23.

⁵ 'Zeitschr. für klin. Med.,' 1883, vi, 511.

⁶ 'Vierteljahrsschr. für öffentl. Gesundheitspf.,' 1879, xi, 396.

⁷ See p. 217, note.

⁸ See Baer, l. c., 517; Schlockow, l. c., 255.

For England we have Baly's report¹ on the prevalence of phthisis from 1825 to 1842 among the convicts at Millbank Penitentiary, where 31 out of 205 deaths were due to cholera, and 75 of the remaining 174, or 43 per cent., due to phthisis; while of 355 prisoners discharged during the same period on account of ill-health, 90 were phthisical, and of these quite three-fifths, according to precedent, would have died of that disease if they had been left to complete their term. In that way we bring the annual mortality from phthisis at Millbank up to 13 per 1000, or more than three times that of the London population at large. Pietra Santa gives the following facts for the prisons of Algiers: Of 23 natives who died in the public prison of Alger, 17 succumbed to phthisis; in the central prison of P'Harrach there were 57 deaths from phthisis in a total of 153, or 37·2 per cent. The important influence of imprisonment on the occurrence of this disease is very clearly brought out by its prevalence in those regions where phthisis is in general a rare thing, as for example in Lower Bengal. Webb² quotes the following remarks by Green with reference to the commonness of the disease among the natives in the prison of Midnapore: "After a careful examination into the early history and origin of the cases of this disease as they have occurred, I have been led to the conclusion that many of the men thus affected were previously hale, and capable of earning their livelihood, and were not subject to cough before imprisonment. I find that after they have been working a few weeks or months on the roads here, and inhabiting the jail, they have become the subjects of attacks of inflammation of the lungs; and from time to time of frequent repetition of these attacks which have ended in some cases . . . in death in the acute stage, in others in a prostrate sinking state with a gradual wasting away of the body and all the symptoms and ultimately all the post-mortem morbid appearances of tubercular disease of the lungs." Next to the hard labour, Green lays most stress on the bad ventilation of the cells and on the highly defective construction of the prison in other respects.

¹ 'Medico-Chir. Transact.,' 1845, xxviii, 113.

² 'Pathologia Indica,' 2nd edition, Calcutta, 1848, p. 108.

The great frequency of consumption in convict prisons may seem to be due to many of the prisoners bringing the disease with them; but that such is not the case follows from the well-authenticated fact that most of the deaths from phthisis among prisoners do not occur until the later years of their term of confinement. At Millbank Penitentiary signs of a pulmonary affection on admission could be made out, as Baly tells us, in only 12 prisoners among 1502 who entered in 1842, and in only 15 among 3249 who were received in 1844. Among the convicts of 1842 there were 510 women sentenced to transportation who remained at Millbank not longer than three months, and of these 2 fell ill with phthisis or scrofula during that time; whereas of the remaining prisoners admitted, no fewer than 47 became consumptive before the completion of their terms of two or two-and-a-half years. It is further to be kept in mind that most of the convicts sent to Millbank had already served longer or shorter terms in smaller prisons elsewhere, and not a few of them more than one term; so that in a certain proportion of those who were found phthisical on admission to the central prison, the seeds of the disease might have been implanted while they were undergoing sentence previously.

There is no doubt that prisoners are exposed to a large number of noxious influences capable of affecting their health or of creating more or less of predisposition to take phthisis, or of augmenting a predisposition already there; and among these a bad or insufficient diet, as we have already seen, might play a not unimportant part. But even under those circumstances, it is evident that the real factor is a protracted detention, or a detention with brief remissions, in crowded and ill-ventilated workrooms and sleeping places. That is the one detrimental thing that obtains with more or less of uniformity in all penal establishments, whatever differences there may be among them in their other arrangements, such as the very various kinds of discipline and occupation.

The same hygienic disadvantages arising out of the manner of living among confined bodies of people, which we have just been considering, contribute not a little also to

the prevalence of consumption, be it more or less, among the population living at large; and that holds good equally for the well-to-do classes and for the poor. Here again, there is no mistaking the drawbacks in the mode of life that have come along with the progress of modern civilisation. "The prevalence of consumption among the families of our villagers and farmers," says an American writer,¹ "can be shown, we believe, to have kept step with the deviation of these families from their former frugal, active, and industrious manner of life, and their adoption of the absurd practices which characterise the mode of our fashionable classes in the larger cities." Once more, I think the stress should be laid on spending the time amidst bad ventilation indoors, in living rooms but more particularly in bedrooms. In the latter the human being spends nearly the half of his existence; and the rooms assigned as bedrooms by the better classes are too often chosen, not on considerations of health, but out of a desire to have the greatest amount of comfort in the public rooms of the house.

But the dark side of modern civilisation nowhere shows its influence for spreading consumption more decidedly than in those disastrous outbreaks of the disease among peoples who were wont to live perfectly free from all restraint and conventionality, but have now come into contact with Europeans and have adopted European manners and vices. Of that we have sad examples in the ravages of consumption among certain tribes of North American Indians,² among the natives of several groups of islands in the Pacific,³ among the Maoris of New Zealand,⁴ and in Algiers.⁵

§ 59. SPECIAL LIABILITY OF THE NEGRO IN CIVILISED COUNTRIES.

No race or nationality enjoys a decided immunity from consumption; but in respect to the frequency of its incidence

¹ 'Amer. Journ. of Med. Sc.,' 1860, Jan., p. 152.

² Suckley, 'Transact. of the Amer. Med. Assoc.,' 1859, x.

³ Brunet, 'La race Polynésienne, son origin, sa disparition,' Par., 1876, 25.

⁴ Power, 'Dubl. Journ. of Med. Sc.,' 1843, March; Tuke, 'Edinb. Med. Journ.,' 1862, Sept., 221.

⁵ Pietra Santa, 'Annal. d'hyg.,' 1861, Jan., 47.

the negro race takes first place. Proof of this is furnished by the medical reports from all those parts of the world to which the negro has migrated, and in the mixed population of which he forms a considerable ingredient : such as the United States,¹ the West Indies,² the Mosquito Coast,³ Brazil,⁴ the Argentine Republic,⁵ Peru and Bolivia,⁶ Algiers,⁷ Egypt,⁸ the East African Islands,⁹ Ceylon¹⁰ and the East Indies.¹¹

In the convict prisons of the United States from 1829 to 1845, the average mortality from phthisis among prisoners of the white race was 11·16 per 1000 ; but among the negroes confined in the Eastern Penitentiary of Pennsylvania it was 40·74, and in the Maryland Penitentiary 28·49 ; while among the coloured population living at large in New York it was 11 per 1000.¹² At Wilmington, N.C., 0·9 of the whites died of phthisis in 1880, and of the blacks 2·6 (Wood). "It is a remarkable fact," says Bartolacci in his work on Ceylon, "that of 9000 Kaffries (negroes from the East Coast of Africa), who had been imported at various times by the Dutch Government into Ceylon and had been drafted into regiments, scarcely a trace of their descendants remains ; they would certainly not be recognised at all among the present population of the island. In the years 1803 and 1810 the British Government imported some three or four thousand negroes from Mozambique into Ceylon to form into regiments, and of these in December, 1820, there were left just 440, including the male descendants."

¹ Bailey, 'Philad. Med. and Surg. Reporter,' 1871, Jan., 453 (for Tennessee); ref. in Transact. of the State Med. Soc. of Arkansas, 1873 (for Arkansas); Wood, 'North-Carolina Med. Journ.,' 1883, March (for the Southern States).

² Jackson, 'Boston Med. and Surg. Journ.,' 1867, July, 447 (for Barbados).

³ Young, 'Narrative,' &c.

⁴ Sigaud, l. c.; ref. in 'Gaz. méd. de Paris,' 1848, 624; Béringer, 'Arch. de méd. nav.,' 1879, Mars, 221 (for Pernambuco).

⁵ Mantegazza, ii, 241.

⁶ Id.; Guilbert, l. c., 20.

⁷ Haspel, Bertherand, Pietra-Santa, ll. cc.

⁸ Pruner, Griesinger, Hartmann, ll. cc.; Isambert, 'Gaz. méd. de Paris,' 1857, 233.

⁹ Deblenne, l. c., p. 201 (for Nossi Bé).

¹⁰ Marshall; Bartolacci, 'View of the Agricultural, Commercial, and Political Interests of Ceylon,' Lond., 1817.

¹¹ Heymann, l. c.

¹² Baer, l. c., p. 513.

Whether this preponderance of phthisis among negroes is an affair of physiological predisposition due to their nationality, or to what extent it may be so due, we are unable to decide. It is certain, however, that the amount of the disease increases considerably among negroes away from their native countries, an increase that depends in part upon climatic influences and in part upon the manner of living. The extent to which a change of climate may operate in that direction will appear from the phthisis mortality among negro troops in the British service at certain military stations:

Comparative Table of Phthisis among British and Negro Troops.

Station.	Deaths per 1000 British.	Deaths per 1000 Negro.
Jamaica .	6.2	7.5
Lesser Antilles	7.1	9.8
Mauritius .	3.9	6.4
Bahamas .	2.0	7.0
Gibraltar .	6.1	33.5

Here we have a confirmation of the well-known fact that the migration of the negro to a colder climate is accompanied by a rise in the phthisical average; but it is obvious that we should also make allowance for changed habits of living as weighing not less in the scale. Pruner calls attention to a fact that has a bearing on the question, namely, that at Khartoum in latitude 17° N., with a temperature not lower than that of the mountains around, consumption ensues among negro captives, as well as among the Arabs of the desert whenever they give up their nomade life to live under a roof, even if it be in a warmer region.

Here also an important part among the disease-factors is played without doubt by bad food, insufficient clothing, and confinement in crowded, filthy and badly-ventilated huts; and there is nothing to surprise us in the experience that consumption has increased to an alarming extent among the negroes of Arkansas of late, or since their emancipation, the result being due, as the authority adds, to the carelessness

and shiftlessness of a class of people who have been suddenly thrown upon their own resources and have been withdrawn from the protection and consideration of a race more intelligent than themselves.

§ 60. HEREDITY VERY STRONG IN PHTHISIS.

Of real importance for the frequent occurrence of phthisis is the transmission of the disease by way of *heredity*. That phthisis propagates itself in many families from generation to generation is so much a matter of daily experience, that the severest sceptic can hardly venture to deny a hereditary element in the case: even if we be unable for the present to decide whether it consists in the transmission of a specific poison, something like that of syphilis, or, in other words, whether it be heredity in the narrower sense; or whether it do not rather depend, as seems to me more probable and more consonant with some things soon to be mentioned, upon a congenital disposition towards the disease, a disposition that has to be looked for, naturally, in the organisation of the respiratory system. The statements of the various authorities differ to no small extent concerning the comparative frequency of the hereditary form of phthisis, or, in other words, the proportion of the inherited cases to the acquired.

One explanation of the discrepancy is doubtless the choice of the cases investigated; another is the varying limits of consanguinity to which the inquiries have extended, one authority reckoning only those cases as hereditary in which the patients had been born of consumptive parents, while another has included in his reference the state of health of the grandparents or of the collateral line. As a general rule, we shall hardly err if we estimate the number of hereditary cases of consumption at not less than 33·3 to 40 per cent. of the total.

In Switzerland, according to Müller,¹ the number of cases in which heredity was made out for certain exceeded by a little (5 or 6 per cent.) those in which the malady had been

¹ L. c., p. 73.

acquired. Walshe found phthisis to be hereditary in 162 out of 446 families, or in one-third of them. In a thousand cases of consumption, Smith¹ ascertained that the parents had been phthisical in 21·1 per cent., and the brothers or sisters in 23 per cent. Brünicke² reckons the number of hereditary cases in Copenhagen at 46 per cent. of the whole. Gjör was able to prove heredity in 197 out of 357 patients treated for phthisis in the hospital of Christiania, or 55·1 per cent.

§ 61. QUESTION OF CONTAGIOUS TRANSMISSION.

Finally, there is not less of far-reaching import in the question of the spread of phthisis by *infective or contagious transmission*, a question that the practitioners of former centuries are known to have taken a very keen interest in, and one that has lately acquired transcendant importance through the labours of Villemin, particularly through Koch's discovery of the tubercle-bacillus, and the admission of phthisis into the circle of infective diseases. It would take me far beyond my limits in this treatise to enter fully upon that subject. I must confine myself to showing what bearing the parasitic or infective theory of the origin of phthisis has upon actual facts that have been ascertained in the course of historico-geographical and statistical research, and to what extent the facts brought to light in either way coincide with one another, or how far they are (perhaps in appearance only) contradictory.

Those who start convinced that the terms "pulmonary consumption" and "pulmonary tuberculosis" cover each other exactly, or that the anatomical changes proper to phthisis in the tissues of the lung depend absolutely and always upon the penetration of tubercle-bacilli into that organ (an assumption that I regard as by no means to be granted, at least for galloping consumption or phthisis florida), and who know, or seek to know, nothing else than the positive results of experiments to inoculate animals with tubercle-bacilli—such

¹ 'Brit. and For. Med.-Chir. Rev.,' 1849, Jan.

² 'Med. Times and Gaz.,' 1862, April.

persons have no object in discussing the question of the spread of phthisis by contagious transmission; it is answered for them absolutely and unconditionally in the affirmative. But the case is different with those who proceed to solve the question from the side of actual experience (and in such matters these men have an important voice), who look at those experiences on all sides, and test their value as proofs that may be adduced in favour of the contagiousness of consumption.

The number of cases hitherto known, which tell in favour of a transmission of the disease from person to person, or which are supposed so to tell, is not small; but the value of these is by no means so great as their bulk. Many observers have hastily concluded "*post hoc ergo propter hoc*;" they have forgotten that two events occurring simultaneously or in near succession are by no means necessarily in the relation to one another of cause and effect, or that they may have proceeded from a common cause. And thus there are in reality only a small number of cases remaining, which may with justice be interpreted in the sense of contagious transmission of the disease. It will have been observed that there have lately been instituted in England "*collective investigations*," or etiological inquiries upon a number of the more ordinary diseases conducted in common according to a definite plan. One of these has had reference to phthisis, and has yielded the following conclusions with respect to the transmission of that disease:¹ of 1078 answers to the question, 673 were simply neutral: that is to say, so many of those who returned the card had no information to give one way or the other; in 105 of the answers the question was decidedly negatived; in 39 the answer was doubtful; and in 261 cases transmission was absolutely affirmed. Among these 261 cases, phthisis had passed from husband to wife in 119, from wife to husband in 69, from parents to children or between the children of one family in 81, to more distant relatives in 13, and to those who stood in no relationship in 8 cases. Professor Humphry, of Cambridge, and Dr. Mahomed, of London, who edited the report of the committee on these collective in-

¹ *Collective Investigation Record*, Part I, Lond., 1882.

vestigations, do not admit any further inference from them than that "if phthisis is a communicable disease, it is only under circumstances and conditions of extremely close personal intimacy, such as persons sharing the same bed or the same room, or shut up together in numbers in close, ill-ventilated apartments" (l. c., p. 41).

In questions such as that before us, a few well ascertained negative facts will be admitted to have more weight than many positive ones; and of such negative facts there is no lack in regard to phthisis. C. T. Williams¹ gives the following facts relating to the Brompton Hospital for Consumption, the largest institution in the world devoted to the treatment of the phthisical:

The hospital has been in existence since 1846, in which year it was opened with 90 beds; in 1856 the number of beds was increased to 200, and in 1873 to 240; three-fourths of the patients suffer from phthisis in its various stages, the remainder being admitted for bronchitis, pleurisy, empyema, chronic pneumonia, and the like. Previous to 1877 the left wing was ventilated most imperfectly; since that year, however, the extraction of foul air has been well performed. The spittoons of the patients are changed two or three times a day; but until lately, no attempt was made to disinfect them unless the odour was unpleasant. The out-patient department was, until the winter of 1881-82, situated in the old hospital, and was much too small for the number of patients, who averaged 200 to 300 daily, mostly phthisical. This large concourse must, on the theory of infection, have proved a considerable source of danger to the assistant physicians, to the clerk who enters their names, and to the porters who marshal them and keep order. "The deficiency in the ventilation," says Williams, "must have led to a large accumulation in the wards of the products of respiration and also of our friends, the bacilli; we consequently ought to have seen an extension of the disease to non-consumptive cases or to the nurses; but nothing of the sort occurred—only the usual results of hospitalism, i. e. erysipelas and sorethroat." Among the physicians, assistant physicians, clinical clerks, nurses, and others, to the number of several hundred, who had served in the hospital (not a few of them having lived in it for a number of years continuously), phthisis had not been more common than it may be expected to be on the average among the civil population of a town; and only in three or four cases could the outbreak of it be brought in any way into connexion with the individual's residence in the hospital. "The evidence of large institutions for the treatment of consumption, such as the Brompton Hospital, directly negatives," Williams concludes, "any idea of consumption being

¹ Brit. Med. Journ., 1882, Sept., p. 618.

a distinctly infective disease, like a zymotic fever." He admits that in his private practice a few cases had occurred of phthisis ensuing in those who had been in very close intimacy with consumptives; "but when we bear in mind the far greater number of examples of consumptives living in close intimacy with healthy people, in such relationships as husband and wife, mother and daughter, or sisters sleeping together, where no spread of tubercular disease has taken place, we must admit that the negative evidence against infection greatly preponderates over that of the very few positive instances."

During a practice of twenty-three years in an extensive district (Tynedale) Fraser¹ had not seen a single case of consumption which told in favour of transmission from husband to wife or *vice versâ*; in twenty-six fatal cases, in which either the husband was affected or the wife, the married couple had shared the same bed, and lived in the closest intercourse with one another, without any transmission of the disease taking place. Over a half of these twenty-six persons had near relatives similarly affected; phthisis had already proved fatal to children of nine of these marriages, and judging from appearances, many more were likely to suffer. Reginald Thompson² has had under observation fifteen well-marked examples of wives infected by husbands, out of something like 15,000 cases of phthisis; so that the proportion may be reckoned as not less than 1 per mille.

Bennet³ gives it as his opinion, based on twenty-five years' experience, that if there have been any spread of phthisis at all by means of contagion, it has occurred extremely seldom and only in quite peculiar circumstances.

Without making too little of the positive facts or too much of the negative, we shall have to admit that contagious transmission of phthisis plays but a subordinate part in the spread of the malady; and it will be all the harder to exclude that conviction, if we bear in mind that many parts of the world, which offer in respect to sanitation favorable conditions for the occurrence of the disease, have little or none of it, although there has been no lack of imported cases. All this seems to show that transmission of phthisis (or tuberculosis) from person to person takes place only

¹ 'Brit. Med. Journ.,' 1884, Jan., p. 193.

² 'Lancet,' 1880, Nov., p. 726.

³ 'Brit. Med. Journ.,' 1884, Oct., p. 704.

under certain conditions; and I hold it to be at least doubtful whether these conditions are created simply by individuals living together in close intercourse.

§ 62. INDIVIDUAL PREDISPOSITION TO PHTHISIS, CONGENITAL OR ACQUIRED.

In consideration of the various facts stated and discussed in this chapter, we must in my opinion hold the relationship of the tubercle-bacillus, *i.e.* of tuberculosis, to the development of consumption to be a question for the present unsolved. But no one need hesitate to affirm that the decisive factor in the genesis of the disease has to be looked for in the *disposition* of the individual to fall into the same. I do not discuss the question whether the patient does not become tubercular until he is phthisical: an opinion that is held in certain quarters. This much, however, seems to me to be made out, that the disposition must be assigned exclusively to abnormal states of the respiratory organs themselves, which had either been congenital¹ or been called forth by external influences acting upon the lungs directly or indirectly. In the same class of directly noxious things predisposing to an attack of phthisis, we have to reckon passing the time in crowded and ill-ventilated places, the air of which is laden with organic decomposition-products or minute particles of mechanical or chemical irritants; also chronic bronchial catarrh (depending sometimes upon the causes just mentioned and sometimes upon the weather), and chronic pneumonias (or pneumonias that had not cleared up), particularly broncho-pneumonias.²

¹ See in particular, Thoma's 'Untersuchungen über die Grösse und das Gewicht der anatomischen Bestandtheile des menschlichen Körpers im gesunden und kranken Zustande,' Leipzig, 1882.

² Green (quoted in Webb's 'Pathologia Indica,' 2nd ed., Calcutta, 1848, p. 106) lays special emphasis, in speaking of the frequent occurrence of phthisis among the prisoners at Midnapur, upon the fact that inflammation of the lungs had in many cases preceded the development of the disease. Also with reference to the phthisis of prisons, Baer says (l. c., p. 519): "It is a very common thing in prisoners who have had an attack of acute pneumonia or pleurisy, for phthisis to ensue. It is but seldom that one finds here the exudations completely resorbed; sooner or later the tuberculous process arises out of these residues."

Among the influences operating indirectly we have to include all those things that are detrimental to the nutrition of the organism in general, making it vulnerable through defective repair of the tissues; and that vulnerability, so far as concerns the lungs, is the cause of their predisposition to morbid processes in general and to consumption in particular. This is the explanation of the disease being so notoriously common among persons living in miserable circumstances and reduced to struggle with want and cares; also of its development in those who have been extremely worn out and reduced by severe sickness, particularly in cases of diabetes and tabes dorsalis, more than the half of which are known to come to a fatal end by intercurrent phthisis.

On the other side, we may thus explain the exemption from phthisis of many parts of the world by reason of their favorable weather-conditions and the consequent rarity of all pulmonary affections therein. The immunity from consumption enjoyed by the natives of elevated regions seems to me to be referable to a peculiarly strong development of their breathing organs and a corresponding power of resistance in them to noxious influences from without; it is proved that this is not at all an affair of "purity of the atmosphere," as some have supposed, by the fact that the state of hygiene in the towns of Ecuador, Bolivia, and Peru, situated at great elevations, is by no means distinguished for its excellence, for cleanliness in the houses and streets, adequate ventilation of rooms, and the like.

I think that I cannot better conclude these brief remarks upon this important subject than in the words of Leichtenstern:¹ "For all Koch's brilliant discovery, there are still many lacunæ and open questions facing us in the etiology of consumption; and these offer to the practitioner, to the statistician, to the pathologist who studies the history and geography, to the pathologist who experiments, and to the bacteriologist a wide field wherein to co-operate. It is not by the power of any sudden enthusiasm, treating the infective nature of phthisis as if it were already made perfectly clear, that the new doctrine will be made secure of its position,

¹ Lecture delivered in Cologne and published in the 'Correspondenzbl. der ärztl. Vereine in Rheinland, Westfalen, und Lothringen,' 1883, April, No. 31.

but by earnest work and prolonged study." I should even go farther, and maintain that these gaps in our knowledge are much greater than seems to be commonly supposed, and that until they be filled up, we cannot promise to ourselves any answer to the question how important the tubercle-bacillus may be for the origin of consumption.

§ 63. ALLEGED ANTAGONISM BETWEEN MALARIAL DISEASE AND PHTHISIS.

In conclusion I have to touch in a few words on the question of an antagonism in place between malarial diseases and consumption, a doctrine that was started by Wells,¹ adopted subsequently by Schönlein, but more particularly followed up by Boudin, who submitted it to a thorough investigation.² Boudin came to the conclusion that in localities where malarial disease is endemic, phthisis is rarely or never seen among those of the inhabitants who have been continuously or for a long period exposed to the malarious influences. In the first edition of this work, I had to treat this question as an open one, for the reason that Boudin's views still found adherents. So far as my own inquiries had gone at that date, I ventured to conclude that the alleged law was based upon an error or upon an arbitrary interpretation of the experiences derived from various parts of the world; and that it was in nowise confirmed on a large survey. The experience gathered since that date in the very worst centres of malaria, both in the equatorial and subtropical zones and in temperate latitudes, including Cochin China,³ China,⁴ Tampico,⁵ Bahia,⁶ Guayaquil,⁷ the east coast of Panama,⁸ the notorious plains of the Sologne,⁹ and Brenne,¹⁰ the marshy

¹ *Transact. of a Soc. for the Improvement of Med. and Chir. Knowledge*, iii, 417.

² *Annal. d'hyg.*, xxxiii, 58, xxxvi, 304, xxxviii, 244; and in his *Traité de géogr. et statist. méd.*, ii, 634.

³ Richaud.

⁴ Duburquois.

⁵ Douillé.

⁶ Ref. in *Arch. de méd. nav.*, 1869, Mai, 340.

⁷ Ref., *ib.*, 1864, Oct. 282.

⁸ Wagner.

⁹ Lafont, *Considérations sur les marais . . . de la Sologne*, Par., 1866, 41.

¹⁰ Hellaine, *De la Brenne au point de vue médical*, Strassb., 1869.

district of Ferrara,¹ the very malarious plain of the Lower Danube,² and the Netherlands,³ have entirely confirmed that earlier conclusion of mine; so that the question is now definitely set at rest in a negative sense.

¹ Bosi e Gambari.

² Leconte.

³ Droeze, l. c., 59.

CHAPTER VIII.

VARIOUS FORMS OF STOMATITIS.

§ 64. APHTHÆ OF THE MOUTH IN OLD WRITINGS INCLUDED A VARIETY OF CONDITIONS.

Under the term "aphthæ" there are included at the present day, as formerly, various morbid conditions of the mucous membrane of the mouth, which have the common property of presenting an appearance of small whitish or yellowish elevations, flat or vesicular in contour, that persist for a longer or shorter time, and either leave no considerable defect of substance behind them or cause disintegration of the oral mucous membrane and the formation of ulcers. They are divided into benign or malignant aphthæ according as the affection proceeds, on the one hand without loss of substance or with speedy repair of the ulcerated mucous membrane, or, on the other hand, according as the local lesion leads to a considerable amount of destruction and, it may be, also the phenomena of a morbid process spreading widely over the mucous membrane of the digestive tract and the symptoms of constitutional disturbance.

This connotation of the term "aphthæ"¹ is found as early as the medical writings of antiquity, and in particular is well developed in Galen.² The name has continued in use through all subsequent periods down into the present century without any considerable additions being made to our knowledge of the things comprehended therein. The first light thrown upon it was the evidence adduced by

¹ *ἀφθαί* is doubtless derived from *ἀπτείν*, to inflame, to infect.

² 'De compositione medicamentorum secundum locos,' lib. vi, cap. ix, ed. Kühn viii, 988-1007.

Vogel,¹ Gruby,² Esterlen,³ Berg,⁴ Reuboldt⁵ and others that one of the varieties of aphthæ had nothing at all to do with morbid processes in the mucous membrane itself, but depended on the growth of a fungus (*Oidium albicans*) among the detached epithelial cells. Next came microscopic investigations to determine the starting-point of the "aphthous" process: in which some of the observers took the line that it proceeded from the follicles (aphthæ folliculares); while others satisfied themselves that the aphthous patches represented a vesicular exanthem produced by the exudation of a serous or fibrinous matter beneath the epithelium and the elevation of the latter in the form of small blebs (aphthæ vesiculares); and still others saw in the disease a sort of diphtheritic process. Bohn⁶ is the first who may be said to have brought light into that chaos of opinions; he made, at least, an accurate study of several of the morbid forms included under the name of "aphthæ," and described them from the anatomical, clinical, and etiological points of view. But if he was the first, he was also strictly speaking the last to occupy himself closely with this chapter of the theory of disease; and it needs, indeed, no more than a glance at the latest current handbooks of pathological anatomy and compendiums of practical medicine to discover sufficient reason for thinking that few chapters of special pathology are so much in need of being thoroughly recast as that on the diseases of the mucous membrane of the mouth.

Only a small proportion of the maladies belonging to this group have a more particular interest for the geography and history; and even in regard to these it is only within a somewhat narrow range that investigation can work, for the reason that our information is too scanty to yield us data that are very useful or very trustworthy. I confine my review, therefore, to the following maladies, which are peculiar in their etiology.

¹ 'Allg. Zeitschr. für Chirurgie,' 1841, No. 24.

² 'Compt. rend.,' 1842, xiv, 634.

³ 'Arch. für physiol. Heilkde,' 1842, i, 471.

⁴ 'Ueber die Schwämmchen bei Kindern.' From the Swedish. Bremen, 1848.

⁵ 'Virchow's Archiv,' 1854, vii, 76.

⁶ 'Die Mundkrankheiten der Kinder,' Leipzig, 1866.

1. *Stomatitis infantum aphthosa.*

§ 65. GENERAL FACTS OF APHTHÆ OF THE MOUTH IN INFANTS.

*Clinical and microscopic characters.*¹—By this term I understand an affection of the mouth occurring in infants almost always within their first year, which is characterised by the appearance on the reddened mucous membrane of the tongue, lips, cheeks or soft palate, of small lentil-sized whitish or yellowish spots, raised somewhat above the surface, and consisting of a deposit of more or less firm fibrinous exudation between the epithelium and the upper layers of the corium. Not unfrequently the small exudations are reabsorbed without the epithelium giving way; whereupon all traces of the spots gradually disappear. Or again, the exudation becomes thicker, breaks through and detaches the epithelium and spreads around; so that a number of spots may coalesce. These confluent patches form rounded or elliptical discs of pultaceous or lardaceous consistence, adhering at first closely to the corium and detaching themselves but gradually from it; the exposed places begin at once to skin over, the process ending with the exfoliation of the morbid product and the restoration of the epithelium, and never coming to ulceration. In no case does this affection develop in the form of a vesicle; nor has it anything to do with the system of follicles. It depends solely upon a narrowly circumscribed inflammation of the uppermost layers of the corium, followed by the exudation of a firm substance which does not assume its lardaceous or tenacious mucous consistence until the epithelium over it has been shed and the saliva mixed with it. But for the increased flow of saliva (which is due to the co-existent catarrh of the buccal mucous membrane), and the tenderness in the mouth during such movements of the parts as sucking or masticating, the malady has no symptoms and is purely local in character. No doubt it is not unfrequently complicated with gastro-enteric irritation, and it would then have the morbid phenomena proper to that condition.

This form of disease—aphthæ properly so called—occurs as a primary and separate malady almost exclusively within the first years of childhood; and it would seem to go essentially with the excited state of the oral mucous membrane that is incidental to dentition. As a secondary affection it shows itself in other diseases of the mouth, more especially in thrush and stomatitis ulcerosa, and in the course of various acute diseases, such as scarlatina, smallpox, typhoid,

¹ I follow here the excellent description of the disease given by Bohn (l. c., pp. 67-95).

and pneumonia; and under these circumstances it is met with in patients of all ages.

So far as we have data for forming an opinion, circumstances of *climate, weather* and *sanitation* appear to have absolutely no influence upon the development or upon the greater or less frequency of stomatitis infantum. It has been concluded from what has been said by Ketelaer¹ and van Swieten² on the endemic prevalence of "aphthæ" in the Netherlands, that the affection is mostly found in localities with a cold and damp climate; but it would be a mistake to apply these observations to the disease now before us, inasmuch as they relate in part to thrush, and in part to other severe affections of the mouth. In like manner there is no importance, as regards this disease, to be attached to hygienic neglect, particularly the neglecting to keep the child's mouth clean; at any rate the fact adduced in evidence, namely that "aphthæ" are unusually common among the children of the poor, and in badly kept foundling houses and lying-in hospitals, does not relate to stomatitis infantum, but to thrush.

2. *Stomatitis vesiculosa.*

§ 66. THREE VARIETIES OF VESICULAR STOMATITIS.

This is a disease characterised by small blebs ranging in size from millet seeds to peas; they develop on the swollen and congested mucous membrane of the tongue, lips, cheeks, and other parts of the buccal cavity; they contain a fluid which is at first clear, but afterwards turbid; in course of time they burst and leave behind them erosions or small ulcers, mostly shallow and sometimes confluent, which heal after a few days, or it may be after a longer period, by the broken surface getting re-covered with mucous membrane. The forms of disease in this group, which come

¹ 'Comment. de aphthis nostratibus seu Belgarum Sprouw.,' Lugd. Batav., 1672.

² 'Comment. in Boerhaavii Aphorismos,' § 978 *seq.*, Lugd. Batav., 1753, iii, 196.

under our inquiry, have all of them the characters of a constitutional malady. As regards the local affection, it is confined not unfrequently to the mouth; while in other cases there is an accompanying affection of the gastric and intestinal mucous membrane; or, again, the morbid process may under certain circumstances fix itself in the skin in the form of an eczematous, impetiginous, or pustular exanthem, either side by side with and at the same time as the affection in the mouth, or independently of the latter. There are three forms of this disease, differing as regards their etiology, that have each a special claim to be set forth in their geographical and historical aspects.

A. Epizootic Vesicular Stomatitis (Foot-and-Mouth Disease).

§ 67. SUMMARY OF FOOT-AND-MOUTH DISEASE IN MAN.

Since the middle of the eighteenth century attention has been directed to a peculiar disease in man, chiefly of the mouth, but sometimes also affecting the gastric and intestinal mucous membrane, as well as the skin, which breaks out in consequence of introducing into the human body the infective matter that causes the foot-and-mouth disease of animals. The first mention of it occurs in the account given by Sagar, an Austrian practitioner, of the epizootic of 1764 in Moravia; other accounts¹ of cases in Austria are those for 1778 by

¹ The following is an alphabetical list of the authorities on foot-and-mouth disease in man:—Adami, 'Ueber die Viehseuche in den k. k. Erbländern,' &c., 105; Albrethsen, 'Hospitals Tidende,' 1870, Nr. 10; Andreae, 'Progr. der königl. med.-chir. Lebranstalt zu Magdeburg für das Jahr 1839,' Amyot, 'Med. Times and Gaz.,' 1871, Nov., 555; Balfour, 'Edinb. Med. Journ.,' 1863, Febr., 708; notice in 'Brit. Med. Journ.,' 1875, Nov., 652; Bircher, 'Correspondenzbl. für Schweizer Aerzte,' 1872, 123; Briseoe, 'Brit. Med. Journ.,' 1872, Oct., 464; Brosche, 'Die Maul- und Klauenseuche der Rinder,' &c., Dresden, 1820; Brunzlow in Casper's 'Wochenschrift für die ges. Heilkde.,' 1840, Nr. 26, 27; Cantani, 'Il Morgagni,' 1881, Apr., 245; Demme, 'Wien. med. Blätter,' 1883, Nr. 1; Dumur, 'Journ. de méd. vétér. de Lyon,' 1868, 220; Duncan, 'Quart. Journ. of Veter. Science,' 1862, Aug., 506; Erdt, 'Magazin für Thierheilkde.,' ix, 420, ix, 34; Fangel, 'Ugeskr. for Laeger 1870,' ix, Nr. 4; Fuchs, 'Thierärztl. Mitth.,' 1870, Nr. 7; Gamgee, 'Edinb. Med. Journ.,' 1863, March, 859; Gaupp, 'Repert. der Thierheilkde.,' 1872, 10; Gierer, in the 'Jahresbericht' of Hering, 1852, 67; Hertwig, 'Pr. med. Vereins-Ztg.,' 1834, Nr. 48; Hildebrandt, 'Maga-

Adami and 1817 by Vieth. We hear of it in Saxony in 1820 (*Brosche*), 1827 in Württemberg (*Kolb*) and in Bohemia (*Nadherny*), 1828 in Styria (*Levitzky*), and 1835 in Fulda (*Schneider*). Cases of this disease were uncommonly diffused and plentiful at the time of the great epizootic of foot-and-mouth disease in Germany in 1838; we have accounts of it from Brandenburg (*Brunzlow*), the administrative department of Magdeburg (*Andreae, Hildebrandt*), Thuringia (*Krieg, Krügelstein*), and the province of Fulda (*Schneider*). Subsequent notices of the malady in Germany relate to the years 1845 (*Gierer*), 1855 in Württemberg (*Schütz*), 1869 in Aix-la-Chapelle (*Fuchs*), 1871 in Württemberg (*Gaupp*) and 1873 in Osnabrück (*Küsener*). For France I know of only one reference to the subject, the paper by Matthieu on a transmission of foot-and-mouth disease to the human subject, which came to his knowledge in the Vosges in 1834. In England and Scotland it is said (but it is not certain) that it occurred for the first time in 1839 (*Balfour*); relating to that year we have accounts of it by Duncan in a locality in Fifeshire, and by McBride, who makes mention of more than twenty-two cases of transmission that had been observed in England from 1839 to 1869. Then come references to it in various parts of Scotland in 1861 and 1862 (*Watson, Hislop, Gamgee*), in England in 1871 and 1872 (*Amyot, Briscoe*), and again in Scotland in 1874 and 1875 (*Millar*).

zin für Thierheilkde., 1840, iv, 140; Hislop, 'Edinb. Med. Journ.,' 1863, Febr., 704; Holm, 'Ugeskr. for Laeger 1870,' x, Nr. 13; Hulin, 'Annal. de la soc. de méd. d'Anvers,' 1873, Avril, 196; Jacob, 'Journ. de méd. vétér. de Lyon,' 1846, ii, 70; Kolb, 'Aphtharum pecorinarum historia,' &c., Tübingen, 1828, S. 8; Krieg, 'Wochenschr. für die ges. Heilkde.,' 1839, Nr. 35; Krügelstein, 'Zeitschr. für Staatsarzneikde.,' 1839, xxxvii, 239; Küsener, 'Pr. Mitth. aus der thierärztl. Praxis,' 1874, 43; Levitzky, 'Oesterr. med. Jahrb.,' 1833, Neueste Folge, iv, 611; Martin, 'Correspondenzbl. für Schweizer Aerzte,' 1872, 331; Matthieu, 'Rec. de méd. vétér.,' xii, 64; McBride, 'Brit. Med. Journ.,' 1869, Nov., 536; Millar, *ib.*, 1875, Decbr., 794; Nadherny, 'Oesterr. med. Jahrb.,' 1831, Neueste Folge, ii, 83; v. Parys, 'Journ. de med. de Bruxelles,' 1873, Févr., 105; Perty, 'Rec. de méd. vétér. prat.,' 1843; Sagar, 'Libellus de aphthis pecorinis anni 1764,' &c., Vienn., 1765; Schneider in Schmidt's 'Jahrb. für Med.,' 1836, xi, 328; and 'Annal. der Staatsarzneikde.,' 1840, 28; Schütz, 'Württemb. med. Correspondenzbl.,' 1857, 96; Stockfleth, 'Tidsskrift for Veterinairer,' 1870, xviii, 179; Veith, 'Handb. der Veterinärkde.,' Wien, 1818, ii, 200; Watson, 'Edinb. Veter. Review,' 1862, Aug., 505; Zürn, 'Die Schmarotzer auf und in dem Körper unserer Haussäugethiere,' 1874, ii, 344.

The only notices of it in *Denmark* that I know of relate to 1869 and 1870 (Stockfleth, Fangel, Alberthsen, Holm); in *Belgium* we hear of it in 1872 and 1873 (Van Parys, Hulin); in *Switzerland* in 1872 (Bircher, Martin) and again in 1881; and in *Italy* one account of it in the province of *Naples* also in 1881 (Cantani).

There can be no doubt that transmissions of foot-and-mouth disease from animals to men have been taking place at all times and in many other parts of the world wherever the epizootic is indigenous; and, in the countries that have been mentioned, it has been much more common, as Bollinger¹ rightly says, than the records show, practitioners being little acquainted with the primary disease, and liable in many cases to make mistakes in their diagnosis of the various kinds of mouth affections which come into their list of "aphthous" diseases. In fact we are as much indebted to the veterinary profession as to the medical for our more intimate acquaintance with this malady.

The *transmission of the morbid poison* from brute to man takes place either through drinking the unboiled milk of ailing cows (perhaps, also, according to Schneider, from partaking of butter or cheese made from the milk); or through introducing directly into some crack or sore of the human skin the morbid products given off from the oral mucous membrane or skin of the sick animal; or it may be in both of these ways. In the former case the disease confines itself mostly to the mucous membrane of the digestive organs, and to the mouth alone in the slighter attacks; in the latter case the disease reveals itself apart from the constitutional symptoms (which are never altogether in abeyance even in the former class), mostly in local cutaneous affections, and these not merely at the point where the poison had been received, but at other parts of the body as well; and it would appear that skin-affections of that kind occur sometimes in cases where the infection had been brought by the milk.

Symptoms and morbid anatomy of foot-and-mouth disease in man.—There are always symptoms preceding the local manifestations of the disease and pointing to constitutional infection,—slight fever, drawing pains in the limbs, headache, loss of appetite, and rarely vomiting.

¹ 'Ziemssen's Handb. der. Pathol. und Therap.,' iii, 639.

Sometimes the patient complains of dryness, heat and pain in the mouth; the mucous membrane of the tongue, more rarely of the cheeks or palate, still more rarely of the throat, looks reddened and swollen; and there appear upon it small yellowish blebs filled with a turbid fluid, which attain something like the size of peas and burst after a day or two, leaving behind them erosions or shallow ulcers with a dark red base. As the disease develops the pain in the mouth increases and sometimes reaches such a height, especially during mastication, that the patient has to abstain altogether from solid food. When the mucous membrane of the throat is implicated the patient suffers from dysphagia and hoarseness. In a case observed by Demme vesicles developed on the mucous membrane of the nose and gave rise to an ill-smelling discharge. Briscoe mentions a case in which the affection of the mouth was so severe and the tongue swollen so enormously that there was no room for it inside the mouth, and it protruded more than an inch beyond the lips. An increase of the salivary secretion always goes with the disease, and there is often swelling of the submaxillary glands and of the lymph-glands of the neck. Very frequently, although by no means in every case, these phenomena of the mouth-affection are complicated with symptoms of gastric and intestinal catarrh, that is to say, vomiting and diarrhoea.

There may be also an eruption of eczematous vesicles on the skin, mostly on the fingers and hands; rarely on the feet, and most rarely of all on the face and trunk; in one case Bircher saw the exanthem covering the whole body. The vesicles are at first the size of a pin head and filled with a turbid fluid, but they reach the size of a pea and turn pustular. After several days they dry up to brownish scabs which fall off in ten or twelve days more, leaving a red spot on the skin, which fades gradually.

In those cases where the disease follows the introduction of the morbid poison through a wound of the skin (for example, from milking the affected cows or from getting the hands or other parts of the body soiled with the slaver from the animal's mouth), the local process usually confines itself to the hands or to whatever part the infecting matter may have touched; but even in these cases, as we have seen, there may always be observed the phenomena of general infection preceding the outbreak of the exanthem. The duration of the disease up to the healing of the erosions or ulcers on the mucous membrane of the mouth, or the fall of the scabs from the skin, is about two or three weeks; in the mildest cases it is as little as ten days or a fortnight, and in cases where healing is slow it may be protracted over a month. The issue has nearly always been in recovery. It is only young children that are in danger of succumbing, from not being able to take enough food and more particularly in consequence of profuse diarrhoea.

I know of only two notices of the *post-mortem* condition in subjects who had died of the disease. In a case reported by Zörn (l. c., p. 345), of a young child who had died of diarrhoea, numerous "aphthæ" and ulcerations were found on the mucous membrane of the intestine. In the case of an infant five weeks old, observed by Demme, the examina-

tion showed centres of parenchymatous inflammation in the liver with consecutive fatty degeneration, also fatty degeneration beginning in the medullary or tubular substance of the kidneys, the mucous membrane of the small intestine slightly hyperæmic, with the follicles swollen and here or there ruptured, but nowhere ulcerations.

Foot-and-mouth disease in animals depends solely upon infection by a *morbid poison*, which resides not only in the local products of the disease, but also in the blood and in the secretions and excretions. An autochthonous, or so-called miasmatic, origin of the disease in animals has never been observed; and likewise in man it occurs solely in consequence of the morbid poison being transmitted, under the circumstances above stated. That the malady should occur most often in children is explained, on the one hand by their feebleness of resistance to morbid influences in general, but more particularly by the fact that unboiled milk—the morbid poison is destroyed completely by boiling the milk—is one of their chief articles of food. In adults the disease occurs most frequently as a consequence of milking or tending the diseased animals. Transmission *per distans* of the disease from brute to man has never been observed.

We may infer from the reproduction of the infecting substance within the organisation of the ailing beast that it is of an organic nature. Bender¹ found numerous micrococci in the purulent contents of the vesicles in animals, and in the pus of the ulcers; no parasitic forms could be detected in the milk. In a case examined by Bollinger (l. c. p. 631) "there occurred in the semi-purulent fibrinous deposits on the ulcers of the mouth many micrococci and small rod-shaped bacteria, as well as spherical bacteria deposited here and there in heaps between the epithelial cells of the desquamating patches." No reproduction of an infective substance capable of acting upon others appears to take place in the body of man; at least no instance is known of the disease being communicated from man to man. In his fatal case in a child, Demme found on examining the ulcerated interior of the mouth many patches of mould, of the leptothrix kind, which he does not think, however, had anything to do with the cause of the morbid process.

¹ 'Zeitschr. für Parasitenkunde,' 1869, i, 289.

B. *Stomatitis vesiculosa materna* (Nursing Sore Mouth).

§ 68. A DISEASE OF NURSING AND PREGNANT WOMEN, CHIEFLY IN THE UNITED STATES; ITS CHARACTERS.

Under the name of "nursing sore mouth," the United States practitioners describe a peculiar affection of the mucous membrane of the mouth in pregnant or nursing women, which is often complicated with a gastro-enteric affection. So far as I have been able to learn from searching carefully in our gynæcological literature and from conversing with several very experienced gynæcologists, this malady has been hitherto unknown in Germany and France. According to a few scanty references from England, including a more recent case reported by Cullen, it has been seen there in occasional instances only. But in the United States it has the character of a true malady of the people, or at least it has had that character within the last fifty or sixty years.

For the sake of comparison with what follows, I quote Cullen's description ('Association Medical Journal,' April, 1853, p. 333) of the morbid phenomena as he observed them in the case that he records under the name of "stomatitis materna": "I was called to see Mrs J—, who was suffering severely from salivation, in the sixth month of pregnancy with her sixth child. The discharge was so profuse as to compel her to have always a small basin at hand to receive the stream of saliva, which would produce vomiting if she attempted to swallow it. No mercury had been taken, and, with the exception of slight heartburn, the general health was good. I prescribed antacids with some relief. In June, the symptoms all returned with increased severity. The tongue and lining membrane of the mouth were unnaturally clean, of a deep red colour, and covered with small ulcers. The sides of the tongue were furrowed with deep cracks or fissures, so that talking produced great pain. Only gruel and arrowroot could be taken (though the appetite was good) and that only when nearly cold. . . . There was no symptom, as in the American cases, of any affection of the mucous follicles of the intestines." The affection disappeared entirely after the delivery.

The first information¹ of the common occurrence of this

¹ I give here an alphabetical list of authors known to me, who have written on this disease: Backus, 'Amer. Journ. of Med. Sc.,' 1841, Jan.; Byford, *ib.*,

disease in the United States comes from the years 1825-30. Clapp (quoted by Hutchinson) described it from observations made by him in 1825 at New Albany, Indiana; Easton, upon its appearance in 1828 at Morristown, Ohio; and Hale in 1830 from his experience of it at Boston. Then came a more considerable series of papers, mostly from the North-Western States: from Indiana by Shields, Evans, Byford, McLean and Hutchinson; from Jacksonville, Illinois, by Prince; from Ohio by Hubbard, Reeves, Schenk and Wright; from Iowa by McGugin and Fountain; and from Missouri by Cormstock. Meanwhile from the Eastern and Southern States there were only occasional notices: by Backus from Rochester, N.Y.; by Pray for New Hampshire; by Faulkner for Virginia; by McKee for Wake County, N. Carolina; by Shanks for Memphis, Tenn.; and by Taylor for Monticello, Florida. From Hutchinson's inquiries there seems to be no doubt that the malady has been seen more commonly since about the year 1830, having been so rare in earlier years that it had escaped the notice of practitioners. It seems also to be ascertained that its principal area is in the North-Western States, where it occurs in the form of an endemic disease, or has so occurred at one time; while in some places, such as Philadelphia,¹ there has been none of it, in other places (Boston, New Hampshire, Memphis) it has been epidemic ("few nursing women of that town escaped it,"

1853, April, 392; Cormstock, abstract in 'Wien. med. Wochenschr.,' 185; Evans, 'North-Western Med. and Surg. Journ.,' 1851; Faulkner, 'Virginia Med. Journ.,' 1837, Decbr.; Fountain, 'North-Amer. Med.-Chir. Review,' 1860, Jan., 89; Gaston, 'Western Journ. of Med. and Phys. Sc.,' 1828, May; Hale, 'Med. Commun. of the Massachusetts Med. Soc.,' 1830 (abstract in 'Amer. Journ. of Med. Sc.,' 1842); Hubbard, *ib.*, 1853, Jan., 269; Hutchinson, *ib.*, 1857, Oct., 369 (prize essay); McGugin, 'Western Med.-Chir. Journ.,' 1851, Oct.; and 'Transact. of the Amer. Med. Assoc.,' 1858, xi; McKee, 'Transact. of the North-Carolina State Med. Soc.,' 1857; McLean, 'Transact. of the Indiana State Med. Soc.,' 1856; Pray, 'Transact. of the New Hampshire State Med. Soc.,' 1857; Prince, 'Chicago Med. Journ.,' 1859, July; Reeves, 'Amer. Med.-Chir. Review,' 1859, Decbr.; Schneck, 'Amer. Journ. of Obstetrics,' 1876, Oct.; Shanks, 'Amer. Journ. of Med. Sc.,' 1842, Oct.; Shields, 'Western Journ. of Med. and Surgery,' Taylor, 'Amer. Journ. of Med. Sc.,' 1843, Jan.; Tait, 'Boston Med. and Surg. Journ.,' 1847, xxxvii, 173; Wright, 'Amer. Journ. of Obstetrics,' 1877, Oct., 511.

¹ In the work by Prof. Dewees of Philadelphia (10th ed., 1854, German ed., 1837), on 'The Diseases of Females,' there is no mention of it.

says Shanks, writing of Memphis in 1842), and in still others, such as North Carolina and Florida, it has been seen only in occasional cases.¹

Clinical history.—The disease begins during the last months of pregnancy or immediately after delivery, in which case it is usually attended by severe symptoms; or it does not show itself until the suckling period, in which case it is for the most part of a mild type. Preceding the outbreak there are always a good many gastric troubles, pyrosis and constipation alternating with diarrhoea; the patient complains of a feeling of heat and burning in the mouth and throat, extending along the œsophagus to the stomach, and associated with profuse secretion of an acrid saliva, which is aggravated materially by anything hot or acid or salt or pungent in the food. The appetite seems at the same time to fail very much, the sense of taste being entirely lost; and the pulse is full, hard and quick. The whole surface of the tongue is of a deep red colour, and the redness spreads at length over the mucous membrane of the whole mouth and throat, although there is no noticeable degree of swelling along with it. Sometimes these local phenomena remit after a few days, to come back again; but more usually the redness is followed by a crop of vesicles on the inside of the cheeks, on the palate, and on the tongue, which soon break and leave small ulcerations, mostly shallow, but sometimes extending deeply (Hale). They heal in eight or ten days, but not unfrequently there are fresh crops of them time after time, so that the malady is often greatly protracted. In some cases the affection concentrates itself exclusively upon the tongue, which looks smooth and as if polished (Taylor); in these cases the local trouble is certainly very intense, although the general health does not suffer in proportion. Much more frequently, however, the mucous membrane of the mouth is implicated all over in one degree or another, and the process extends from it down the œsophagus to the stomach, and, it may be, over the whole intestinal canal, in which latter case it establishes itself mostly in the colon and not unfrequently causes sloughing of the mucous membrane to a considerable depth. Sometimes the process spreads from the throat through the posterior nares to the mucous membrane of the nose, and thence to the antrum and frontal sinuses; at other times through the Eustachian tube to the tympanum, Byford and others having seen deafness following in cases of that sort; in still other cases it extends down the larynx and trachea to the bronchial mucous membrane. In a few instances Byford, Hutchinson, McKee and others saw it spread from the rectum to the

¹ It is highly noteworthy that Heymann, in his account of stomatitis intertropica in the East Indies, which will be referred to in the sequel, remarks upon a disease of the same kind, which occurred in pregnant women and was of a very mild type and without intestinal complication, the affection of the mouth ending with the delivery and without producing any injurious effects on the mother or child.

vagina; so that, as Hutchinson says, there is actually no mucous membrane of the body which the lesion, in its extension from the mouth, has not fastened upon.

In addition to these local lesions, there are always disorders of digestion noticed, which vary in intensity with the mouth affection; while, as we have seen, they often precede the redness and vesiculation in the mouth by several weeks. The urine is for the most part diminished in quantity, of a dark colour, and with a copious sediment. If the intestinal affection become at all severe, diarrhoea takes the place of the usual constipation, the dejecta being liquid, slimy, and, in bad cases, tinged with blood; the patient complains at the same time of weight in the abdomen and colicky pains. There are a few severe cases, with the lesion going even no farther than the mouth, where weakness, emaciation, and pallor of the face occur; and in these also a feeling of weight in the præcordia is noticed. But the appetite, for the most part, does not fail altogether; and even when the trouble lasts all through the time of suckling, as not unfrequently happens, the patient is for the most part able to look after the household affairs; and after several weeks or even months, during which the symptoms will have been from time to time in abeyance and from time to time aggravated, recovery sets in. But when the morbid process takes a wider range, the appetite very soon fails altogether, the patient gets no sleep, exhausting colliquative perspirations occur, the skin becomes pale, emaciation proceeds to the last degree, and death ensues from marasmus, all the more certainly if the bronchial mucous membrane have been implicated along with the others. In the few cases already mentioned, where the morbid process was almost confined to the tongue, the small erosions were seen to coalesce and the ulceration at the same time to extend deeper, so that there was an actual defect of substance in the tongue of more or less considerable extent. In women who are suckling, the secretion of milk does not suffer the least disturbance during the whole course of the malady, and the mother may continue to give suck without the child taking the smallest harm.

Morbid anatomy.—Examination of the bodies of those who had died of this disease always revealed a more or less considerable affection of the intestinal mucous membrane. In one case McLean found numerous ulcerations in the œsophagus, as well as in the stomach, where several of the ulcers had penetrated to the muscular coat; the mucous membrane was normal in the duodenum, in the colon there were several spots of inflammatory redness, also traces of inflammation at the neck of the bladder, and a few ulcerations in the vagina. In another case, where the disease had been protracted for several years with successive pregnancies, Hutchinson found localised spots of peritonitis, the kidneys soft and hyperæmic, with pus in their pelvises, especially the right, the surface of the ureters red and inflamed, ulceration in the cæcum and still more of it in the colon, but the small intestine and stomach almost normal, the spleen soft and studded with small points of pus, the liver enlarged and hyperæmic, with its right lobe softened and black, grumous bile in

the gall-bladder. Hubbard also found in one case deep round ulcers in the ileum and colon.

Whether the *climate* and *weather* have any influence in determining the occurrence of stomatitis materna cannot be decided from the facts before us. Shanks lays stress on the circumstance that the disease has a more severe type in Memphis than in more temperate latitudes such as Rochester, N.Y.; and he finds an explanation in the climate proper to the former place, namely, the hot and protracted summer and the damp, mild winter: which conditions, he thinks, have a relaxing effect on the mucous membranes. On the other hand Pray is clear in his opinion, based on New Hampshire experiences, that the epidemic outbreak and prevalence of the disease are quite independent of weather and season. It is equally difficult to trace any causal connexion between the malady and the state of the soil, marshy soil more especially. McKee remarks that the district of Wake County, N. Carolina, where he had often seen stomatitis materna, lies high on a granite bottom with an excellent water supply; and that the malady has broken out in many other country localities where the inhabitants enjoy "good and pure drinking-water and pure air." These facts serve at the same time to overthrow the hypothesis of those who would ascribe stomatitis materna to the use of water impregnated with lime, or would make out living in a dense and damp atmosphere charged with organic effluvia to be an essential factor in the etiology. Against the latter doctrine there is another fact pointed out by Backus, Taylor and others, namely, that the disease is equally common among women in all ranks of life.

We are entirely in the dark as to the proper cause of the disease, nay even as to the class of influences among which the cause may be looked for. On the other hand, there is no question that one of the most important predisposing causes will be found to be *individual constitution*. Nearly all observers are agreed in saying that it is chiefly the weakly or ailing, and especially scrofulous women, who are subject to the malady; that there is also a real cause for it in the anæmia produced by suckling as well as in the loss of strength which is not unfrequently associated with the

duties of prolonged nursing; and that the gastric disturbances which precede the symptoms pathognomonic of the disease have to be regarded in a two-fold aspect: as revealing the presence of a constitutional ailment that underlies the morbid process as a whole, and as introducing a new element into the general state of ill-health through the malnutrition which they necessarily cause.

c. Stomatitis intertropica.

§ 69. CLINICAL CHARACTERS; AFFECTS WELL-TO-DO EUROPEANS IN THE TROPICS.

The earliest information about this peculiar malady, which has been called "*aphthæ tropicæ*" by those who have studied it ("*Indian sprouw*" by the Dutch), occurs in Hillary's work on the diseases of Barbadoes (2nd ed. 1766).¹ Next come the accounts by Chisholm and Latham, also relating to the *West Indies*, by Schorrenberg of the disease as he saw it in *Curaçao*, by Bosch, Heymann, Greiner and van der Burg for the *Malay Archipelago*, by Donald for *Ceylon*, and by Manson for *Singapore*, *Manilla* and the coast of *China*, particularly *Amoy*.

Clinical history.—The disease is always associated with chronic catarrh of the stomach, and constitutes one of the worst complications of that malady, not unfrequently killing the patient or at least hastening his end. The affection of the mouth is always preceded by symptoms of gastric disorder, such as loss of appetite, weight at the præcordia

¹ The following is an alphabetical list of the authorities on stomatitis intertropica quoted in the text: Bosch, '*Over de indische sprouw (aphthæ orientales)*,' Amsterdam, 1837; v. d. Burg, '*Geneesk. Tijdschr. voor Nederl.-Indie*,' 1880, x, 1; Chisholm, '*Manual of the Climate and Diseases of Tropical Countries*,' London, 1822, 22, 61; Donald, '*Brit. Med. Journ.*,' 1881, April, 681; Greiner, '*Geneesk. Tijdschr. voor Nederl.-Indie*,' 1871, i, 315, 1873, iii, 891; Heymann, '*Krankh. in den Tropenländern*,' Würzb., 1855, 70; Hillary, '*Observ. on the . . . Epid. Diseases of Barbadoes*,' Lond., 2nd ed., 1766 (Germ. ed., Leipzig, 1776, p. 32); Latham, '*Med. Transact. of the London College of Physicians*,' 1815, v, 57; Manson, '*Customs Med. Reports*,' Shanghai, 1880, March, 33; Schorrenberg, '*Nederl. Lancet*,' 1843, Septbr., vi, 480.

(especially after food), pyrosis, vomiting, irregular defecation, and diarrhoea alternating with constipation. The local affection shows itself first in small red spots which break out in various parts of the mouth, especially around the edges and on the tip of the tongue, gradually extending over the whole of that organ and giving it a shining brick-red appearance, as if it were varnished. As the disease progresses, the surface of the tongue becomes cracked, and pin-head vesicles start up here and there, which burst and leave small excoriations that soon heal. Meanwhile the sense of taste is affected; and in consequence of diminished secretion of mucus, the patient complains of great dryness in the mouth, and of pain on moving the tongue, or on eating food of an acid, salted or spiced description, or on imbibing spirituous liquors. In this way the disease goes on for weeks or even months and years, with constant alternations between better and worse. Gradually, in consequence of the loss of sustenance and the co-existent intestinal catarrh, there come on the symptoms of constitutional illness, such as anæmia, wasting to the bone, great weakness and depression of spirits. The patient dies at length in a state of extreme exhaustion; or death may be from some intercurrent disease, which is in many cases led to take a fatal turn really by the patient's weakened condition. If a proper treatment be adopted early in the case, the prognosis is not unfavorable; the most ominous sign is the occurrence of relapses time after time; and the surest means of stopping them is to send the patient away from the tropics.

Intertropical stomatitis occurs almost exclusively in strangers and principally among Europeans, being rarely seen in the natives; of 203 cases observed by van der Burg, 171 were in Europeans and only 32 in natives. The real causes of the disease are the same that lead to the endemic prevalence in the tropics of disorders of the mucous membrane of the digestive tract, principally the *high temperature* associated with *improper food*. That explains the preponderance of the malady among the Europeans, the non-acclimatised in particular, and the comparative immunity of the more abstemious natives. It is also noteworthy, as pointed out by van der Burg, that the well-to-do classes are more subject to it, *cæteris paribus*, than the necessitous part of the population; and that, also, may be ascribed perhaps to errors of diet. Spirit drinking appears to have no significance. That a high temperature has a determining influence in the causation is further shown in the fact mentioned by Manson, that this form of stomatitis runs a more rapid and more pernicious course in hot places such as Manilla and certain parts of

Further India (the Straits Settlements in particular), than in climates such as those of Singapore and Amoy, where the heat is less. It would appear from a remark of van der Burg that *pregnant women* and, still more, *nursing women* are peculiarly predisposed.

3. *Follicular Swellings of the hard Palate in Newborn Children.*¹

§ 70. CLINICAL CHARACTERS; AN EGYPTIAN FORM.

Along with the diseases of the mouth already spoken of, I have to include, for reasons presently to be given, the follicular swellings of the hard palate in newborn children, which were first described by Reuboldt² and Virchow,³ and afterwards more fully by Bohn,⁴ Epstein⁵ and Leboucq.⁶

This affection is an affair of round or oval nodules from miliary to pin-head size, and of a whitish or yellowish colour, which are met with in clusters or singly in and around the raphe of the hard palate in newborn infants. Sometimes they disappear during the first weeks of life; usually they last for months, subsiding gradually and leaving traces visible for some time longer in the form of white rings beneath the epithelium. The nodules are clearly of foetal origin. As the inquiries of the above-named writers have shown, they represent cysts in the mucous membrane of the hard palate, which take origin from the mucous glands; they correspond therefore, as Virchow has pointed out, to the milium or comedo of the skin, being, like the latter, true follicular tumours and acquiring the same character as a cutaneous acne from enlargement of the sac, hyperæmia and inflammation of the adjoining surface, and the throwing out of a fibrinous exudation. Like acne, they either come to an end by the inflammatory products being absorbed, or they

¹ The infantile affection of the palate which results in ulceration was well known to a number of earlier writers, but was not correctly understood by them: such as Billard, 'Traité des Maladies des Enfants nouveaux-nés et à la mamelle,' Paris, 1828; Barrier, 'Traité pratique des maladies de l'enfance,' Lyon, 1845; Valleix, 'Clinique des maladies des enfans nouveaux-nés,' Paris, 1838; and Bednar, 'Die Krankheiten der Neugeborenen und Säuglinge,' Wien, 1850. Herz describes the diseases as a kind of "stomatitis aphthosa" ('Wien. med. Presse,' 1866, Nos. 4-7).

² In 'Virchow's Archiv,' 1854, vii, 84.

³ *Ib.*, 1855, viii, 384.

⁴ 'Die Mundkrankheiten der Kinder,' Leipzig, 1866, p. 47.

⁵ 'Prager Zeitschr. für Heilkde.,' 1880, i, 59.

⁶ 'Arch. de Biologie,' 1881, ii, 399.

go on to disintegration of the affected parts and to ulceration. The ulcers are mostly shallow and they usually heal within a few weeks by granulations springing up from their floor; it is not often that they take on the type of erosions (the most usual occasion of that would seem to be the exposure of the child to the influence of bad sanitation); but, when they do, the edges of the ulcers have even been known to become gangrenous and the bone to become necrosed. It is highly probable, according to Bohn's contention, that the follicular lesions of the gastric mucous membrane are connected with these follicular affections of the mouth; the former also descend from fetal life, being met with not unfrequently in the newborn; like the nodules of the palate, they give rise to ulcers and lead to death with symptoms of vomiting and diarrhoea. As Bohn conjectures, "the follicular enlargements and the acne of the hard palate in newborn children are only part manifestations of a fetal process which is at work in the follicular apparatus of the whole intestinal canal. This process comes to an issue as a separate and distinct phenomenon, and in so doing it either keeps within physiological limits or it is aggravated into a morbid condition."

Bouton de l'enfance, or Bruffalo.—The morbid process, according to the foregoing explanation of it, has a further and special interest inasmuch as it is found unusually often in Egypt, according to Rossi¹ and Anelli², being widely known in that country under the name of "*bouton de l'enfance*."³ The account given of the follicular tumour by both of these authorities corresponds entirely with the above description taken from Bohn. In respect of the pathological developments Rossi merely mentions a considerable degree of swelling of the mucous membrane keeping pace with the growth of the tumour; Anelli, on the other hand, speaks of ulceration, of an affection of the gastric mucous membrane which is a common symptom of the later stage, and of the disease terminating in death.

¹ 'Gaz. méd. de Paris,' 1862, No. 2. p. 29.

² 'Annali univers. di med.,' 1871, Sept., p. 514.

³ Pruner (l. c., p. 202) also mentions the disease under its colloquial Egyptian name of "*dime*," but he takes it all for a midwife's fable: "We could never discover," he says, "these alleged nodules"—probably because he did not look for them systematically. But there certainly seem to have been a good many questionable diagnoses, as these were mostly made by women who had medical charge of the infants.

4. *Stomatitis ulcerosa.*

Mundfäule (German), *Stomacace* (French), *Fegar* (Spanish).

§ 71. HISTORY AND CLINICAL CHARACTERS.

Contrasting with the inflammatory diseases of the mucous membrane of the mouth already discussed, those namely that appear in the form of vesicles (becoming small shallow ulcers), and have their seat on the tongue principally, but also on the lips, cheeks and palate, the disease known as "*stomatitis ulcerosa*" is one that really affects the gums. It begins on the surface of the gums, penetrates deep into the tissues and reduces them to a spongy state of pulp and ichorous disintegration. It arises under various circumstances, sometimes as a primary or autochthonous malady, sometimes as part manifestation of a general morbid process. It has a peculiar interest for our inquiry in respect of its endemic or epidemic prevalence within certain narrow limits, especially among the soldiers of two or three European countries, including France.

The history of *stomatitis ulcerosa*, or, as I shall term it for shortness sake, "*putrid mouth*" (*Mundfäule*), can be followed back with certainty no farther than the end of the eighteenth century. Whatever had been written of the disease previous to that is more or less hidden from view under the comprehensive term "*malignant aphthæ*;" or it has to be sifted out from the older writings on *noma* (*cheilocacé*), which has been much confused with *stomatitis ulcerosa* even down to the present time; or, finally, it has to be sought in the more recent writings on "*stomacace*," a term which stands, like "*malignant aphthæ*," for a parti-coloured mixture of the various sorts of diseases of the mouth and has been freely used by many of the older authors as interchangeable with *noma* itself.

The first independent attempts to understand the putrid mouth, or the earliest descriptions of it that are true to nature, occur in the writings of certain French hospital physicians and surgeons who had opportunities of seeing it on a great

scale among children, such as Guersant¹ and Taupin;² although the latter understood so little of the anatomical nature of the disease that he identified it, following the lead of Bretonneau, with diphtheritic affection of the mouth and even with noma. It was not until the classical work of Bergeron³ that the nature of the putrid mouth was fully explained. That author gave a masterly description of it under the name of "stomatite ulcéreuse," from observations made among the French troops; and he set in the clearest light its points of contrast with other ulcerous and necrotic processes of the oral mucous membrane, although he has not succeeded in preventing confused ideas about the malady from being still held, or in rescuing the term "stomacace" from its old chaotic associations. I shall be justified, therefore, in sketching here the figure and type of the disease in its main outlines.

Clinical characters.—Putrid mouth⁴ begins its course without any definitely pronounced prodromal stage such as would point to a constitutional illness; and it is without fever. The troubles which precede by a little or accompany the first outbreak of symptoms are, like the signs of constitutional illness which come on somewhat later, due either to the complication of other morbid states, or to the consequences of the local lesion, including therein the continual acute pain, the drain of fluid, the insufficient sustenance, the resorption of ichor, and the like. The disease begins with redness of the mucous membrane and tenderness (slight at first) of the gums, which are extremely hyperemic, swollen and spongy, raised into a ridge along their free margin, appearing as if loosened from the teeth, and apt to bleed on the slightest touch. After a few days purulent disintegration shows itself in the affected gum, and ulceration;⁵

¹ 'Dictionn. de méd.,' 1827.

² 'Journ. de connoiss. méd.-chirurg.,' 1839, Avril.

³ Bergeron, 'Sur la stomatite ulcéreuse des soldats,' Paris, 1859.

⁴ This account of the disease-type is mostly based upon the descriptions of it as it occurs in soldiers and sailors by Bergeron and other medical officers of the French army and navy who are named in the sequel; as well as on the observations of it by Taupin ('Journ. des connoiss. méd.-chir.,' 1839, Avril) and by Bohn (l. c., p. 109) from cases in children.

⁵ The bleb-like elevation of the mucous membrane before ulceration begins, which has been described by Cafford, is explicitly stated by Bergeron, Bohn, Catelan and others to be a mistake:—"On a voulu décrire une pustule ou vésicule initiale," says Catelan (l. c., p. 271), "rien de pareil n'existe; ce n'est qu'une apparence. Sur les points frappés de mort, l'épithélium imbibé peut, en se détachant, se soulever par petites lamelles arrondies, donnant l'illusion d'une vésico-pustule, mais c'est un simple effet de macération."

the ulcerated surface is covered with a greyish or yellowish pulpy mass somewhat firmly attached, and soaked in a sanguino-purulent or ichorous fluid. Most usually the process develops at the incisor or canine teeth on one side of the upper or lower jaw; and it ordinarily remains unilateral, spreading along the anterior surface from the middle line towards the articular angle, and thence along the posterior side of the gum, and at the same time extending superficially and deeply; but in other cases it crosses the middle line and spreads widely over the gums of the upper and lower jaw. Not unfrequently it remains confined to the gums; but it is common for it to extend to other parts of the cavity of the mouth, notably the inside of the cheeks and lips, not so often the edges of the tongue, and seldome of all the soft palate, uvula and tonsils. In quite exceptional cases it has been seen to spread even to the fauces. This secondary lesion, or extension beyond the gums, has its commencement marked in like manner by a puffed and hyperemic state of the mucous membrane; it then proceeds, as on the gums, to ichorous disintegration and ulceration, the ulcers being covered with a pulpy substance, as before, and often enlarging to a considerable size. The secondary process always begins at some spot of the cheek or lip which comes into direct contact with the ulcerated surface of the gum on shutting the mouth. The teeth are gradually laid bare at their necks by the destruction of the gum, they become loose in their sockets, and not unfrequently fall out at length. When the disease is at its height there is always great tenderness of the affected parts, which is felt on the slightest movement of them, even on taking food in a fluid form. The secretion of the mucous membrane is increased, saliva mixed with sanious matter flows from the mouth continually, a pestilential stench is given out with the breath, the lymphatic glands under the chin and in the neck are swollen, and when the buccal mucous membrane is implicated, there is usually œdematous swelling of the cheek. In particularly severe cases, which are very rare and almost confined to children, the disease may go the length of destroying the periosteum of the alveolar process and so inducing necrosis of the jaw; in the rarest cases of all there is gangrene of the soft parts, and death. For the most part the disease runs a favorable course, even if the patient have been grossly neglected. When the infiltrated tissue has been completely disintegrated the ulceration begins to cicatrize, the pulpy deposit is loosened from the surface and thrown off, the stench from the patient's mouth and the flow of saliva subside, the tenderness ceases, and when a new gum is formed in close adhesion to the teeth, the restoration to the normal is complete.

§ 72. EPIDEMIC AND ENDEMIC IN INSTITUTIONS FOR CHILDREN,
AND AMONG FRENCH TROOPS.

Among the civil population at large, and particularly among adults, stomatitis ulcerosa is a comparatively rare and always sporadic disease. It is more frequent in the age of childhood, especially at the dentition period. But in the form of an *endemic* or *epidemic* malady it is never met with except in detached establishments, or in the holds or 'tween decks of ships and among bodies of troops. To the former class belong more especially foundling hospitals, orphanages, children's hospitals or other institutions for the reception of poor children; less frequent seats of epidemics or endemics of putrid mouth are factories, workhouses and prisons.¹ To the latter class belong the epidemics or endemics of the disease that have been observed during the last hundred years in the French army and navy.

There seems to be no doubt that stomatitis ulcerosa had become domesticated among these bodies of troops since the end of the eighteenth century. The first information about it dates from 1793 and 1794, in which years the disease was prevalent in the French army during the Italian campaign,² and subsequently among the troops that wintered in the Maritime Alps and came thence to Toulon to take part in the projected expedition against Corsica.³ In 1807 it broke out in the French army after the battle of Eylau;⁴ next come accounts of its epidemic prevalence among the French troops during the Spanish campaign of 1810, at Madrid, Toledo, Retiro, and other places;⁵ again in 1818 at Tours⁶ among soldiers belonging to the Vendée legion; and in that and

¹ With reference to the epidemic occurrence of stomatitis ulcerosa in prisons, an interesting account has lately been given by Ogg ('Brit. Med. Journ.,' 1880, April, p. 532) for the convict prison of Coimbatore (Madras Presidency) in 1878.

² Desgenettes, 'Journ. gén. de méd.,' An v, ii, 247.

³ Larrey, 'Med.-chir. Denkwürdigkeiten, &c.' From the French. Leipzig, 1813, i, 22.

⁴ Id.

⁵ Alard and Leroux, 'Journ. de méd.,' 1812, Aug., 354; Montgarny in Ozanana, iv, 287.

⁶ Bretonneau, 'Des inflammations spéciales du tissu muqueux, &c.,' Paris, 1826, 14. He makes the mistake of identifying the disease with diphtheria of the throat, which was prevalent at the same time.

following years the putrid mouth became widely spread in many garrisons of the south of France, including those of Toulouse, Montauban, Foix, Carcassonne, Narbonne, Perpignan, Bezières, Montpellier, Aix, St. Esprit and Toulon.¹ For 1831 there are notices of the disease being epidemic among the troops at Beaucaire (Dept. Gard²) and Schlettstadt;³ for 1833 at Carcassonne;⁴ and for 1834 at Toulouse, where stomatitis broke out among troops arrived from Algiers and followed them when they were moved to Aix and Antibes.⁵ In 1842, 1843 and 1848 it was prevalent in the garrison of Briançon, in 1852 and 1853 at Perpignan,⁶ and in 1855 among the troops in Paris. It was the experiences gathered in the last mentioned epidemic that laid the foundation of Bergeron's masterly treatise. More recent accounts of putrid mouth in the French army are those for Strassburg⁷ in 1863, Paris⁸ in 1867, Lyons⁹ in 1870, and Auxerre¹⁰ in 1871. Moreover the disease has been seen among the troops stationed in French colonies, such as Algiers¹¹ and Guadeloupe.¹²

Bergeron's opinion that putrid mouth was almost unknown in the French navy has been shown by subsequent inquiries to be erroneous. Even before the publication of his book, reports had appeared of its prevalence in the harbours of Rochefort¹³ and Brest;¹⁴ and there are later accounts of it on

¹ Angelot, 'Revue méd.' 1827, Juill, 49; Brée, 'Mém. de méd. milit.' 1824, xxxv, 169; Gordon, ib., 1830, xxxviii, 129; Caffort, 'Arch. gén. de méd.' 1832, Jan., 56.

² Bland, 'Revue méd.' 1832, Juill., 19.

³ Cognat, 'Travaux de la soc. de méd. de Dijon,' Année 1832, 22.

⁴ Malapert, 'Mém. de méd. milit.' 1838, xlv, 280.

⁵ Léonard, ib., 1835, xxxviii, 296.

⁶ Lacronique in Bergeron, 26.

⁷ Péchaud, 'De la stomatite ulcéreuse spécifique chez les soldats,' Strassb., 1863.

⁸ Beltz, 'Gaz. des hôpit.' 1868, Nr. 9, 34; Besnier, 'L'union méd.' 1867, Nr. 47, 113; Nr. 73, 503.

⁹ Lubanski, 'Lyon méd.' 1871, Oct., 426.

¹⁰ Feuvrier, 'Mém. de méd. milit.' 1873, Septbr.-Oct., 449.

¹¹ Léonard, l. c.; Armand, 'Méd. et hyg. des pays chauds, &c.,' Paris, 1860, 413.

¹² Carpentin, 'Arch. de méd. nav.' 1873, Decbr., 433.

¹³ Sagot Duvaux, 'Essai sur la stomatite régnant épidémiquement parmi les militaires nouvellement arrivés au corps,' Montp., 1832.

¹⁴ Guépratte, 'Journ. de conaiss. med.-chir.' 1844, xi.

board a ship of war in the Indian Ocean in 1863¹ and on board another on the voyage to Cochin China the same year.² In 1868 it reappeared on board a ship cruising off the coast of Cochin China,³ in 1875 it broke out in the school-ship in the roadstead of Hyères,⁴ in 1876 on board a transport bound from France to New Caledonia,⁵ and in 1878 a second time in the training ship at Hyères.⁶ From the search made by Catelan and Maget in the case books and medical reports deposited in the arsenals of Toulon and Brest, it would appear that the disease had also been very common in the French ships-of-war in ordinary. In the Toulon records from 1860 to 1871 there are notices of putrid mouth in two ships cruising in the Mediterranean, in a ship stationed on the coast of Syria, in two ships moored in the roadstead of Hyères, in several vessels on the Chinese and Japanese station, and in a transport from France to New Caledonia.

In the records of the arsenal of Brest, there is mention of it in a frigate on the passage between Tahiti and Cape Horn, in a ship cruising off the coast of Mexico, in another on the South Sea station, in two ships which made voyages round the world in 1867-68 and 1871-72, and in a vessel on the West Indian station. These notices, as we learn from Catelan and Maget themselves, are by no means the whole; so that the malady would seem to have been no rarer in the navy than in the army.

This fact of the epidemic or endemic prevalence of stomatitis ulcerosa among the French forces ashore and afloat, striking as it is in itself, becomes still more interesting when we consider that the malady has never been seen either as an epidemic or an endemic among the forces of any other European states except Portugal, Belgium and Turkey. As we learn from the perfectly trustworthy infor-

¹ Huguet, 'Relat. méd. d'une campagne dans les mers de Chine, &c.,' Paris, 1865, 17.

² Lagarde, 'Arch. de méd. nav.,' 1864, Mars, 163.

³ Martin-Dupont, 'De la gingivite ulcéreuse des matelots,' Paris, 1872.

⁴ Catelan, 'Arch. de méd. nav.,' 1877, Août-Oct., 122, 161, 241.

⁵ Maget, 'Étude sur l'étiologie de la stomatite ulcéreuse des soldats et des marines,' Par., 1879.

⁶ Mourson, 'Arch. de méd. nav.,' 1879, Oct., 263.

mation collected by Bergeron, that immunity holds good for the armies of Spain, Italy (or Sardinia), Prussia, Austria, Holland, Great Britain, Denmark, Sweden and Russia; and for the period subsequent to the publication of Bergeron's book, I have not found a single reference to putrid mouth among the troops of these countries; nor do I find it once mentioned in the numerous army medical reports of the United States. But in Egypt, Pruner¹ speaks of having seen the disease in the military hospitals.

Instances of putrid mouth in the Portuguese army are quoted by Bergeron from the reports of surgeons Mendez and Valle; for the Belgian army we have only the notices of somewhat older date by Vleminckz,² Marechal³ and several other military surgeons;⁴ and for the Turkish forces the observations of Mühlig and Sandwith, the latter of whom says that the malady occurs only in the Turkish fleet.

§ 73. SAME MORBID CONDITION MAY ENSUE FROM MERCURY
AND PHOSPHORUS, AND FROM SCURVY.

There are few diseases that seem to be more favorably placed for the study of their etiology than stomatitis ulcerosa, by reason of its limited diffusion within certain narrow areas and among certain classes of individuals, a limitation which promises to throw a clear light upon the real factors in the pathogenesis. Still the inquiry, thoroughgoing although it has been, has led to hardly anything but a somewhat exact knowledge of certain predisposing causes. And if we would fill up the gaps that remain in the etiology with something better than empty words or unproved hypotheses, we shall have to take Bergeron's attitude of thirty years ago, and look to the future for a solution of the problem, notwithstanding the large amount of experience that has been added between then and now.

Coming to our inquiry of how the development of the

¹ 'Krankh. des Orients,' 203.

² In Bergeron.

³ 'Arch. med. belges,' 1852, Septbr.

⁴ 'Ib., 1857, Mai, Juin.

⁵ 'Zeitschr. der Wien. Aerzte,' 1852, Jan., 28.

⁶ 'Assoc. Med. Journ.,' 1854, Mai, 433.

malady is affected by influences both external to the individual and within him, we have first of all to keep in mind that stomatitis ulcerosa corresponds from the anatomical and clinical points of view to a single process, while, as regards its causation, it may arise under a variety of exterior circumstances.

Not unfrequently the disease is due to irritation of the mucous membrane of the mouth by *certain poisons that have a specific action on it*, such as *mercury* and *phosphorus*. The stomatitis so produced, especially that caused by phosphorus, differs from the malady observed in epidemics among children and soldiers merely in the severity of its type; in other respects there are no differences discoverable, whether anatomical or clinical. Also in the *affection of the mouth in scurvy*, well known to be one of the earliest and most constant symptoms of that disease, there are the same state of parts and the same clinical phenomena as in the putrid mouth which occurs under the circumstances above stated. In scurvy, doubtless, we know with tolerable accuracy the influences that give rise to the peculiar constitutional errors of nutrition; but we are altogether in the dark as to the precise relation of the morbid process to the gums.

§ 74. FACTORS OF ITS ORIGIN AMONG THE CIVIL POPULATION.

In those cases of stomatitis ulcerosa, not altogether rare, which occur among the population at large and independently of the causes hitherto mentioned (mercury, phosphorus, scurvy), a real cause predisposing the malady to spring up would appear to be errors of nutrition of various kinds, either due to such unfavorable conditions of living as want of food, or the sequel of an exhausting disease. These cases are mostly found within the years of childhood; and in the somewhat frequent epidemic or endemic prevalence of putrid mouth in foundling hospitals, orphanages and other institutions for children, we may discover some specific relationship to that time of life, justifying from a pathogenetic point of view the notion of a *stomatitis ulcerosa puerilis*. It would appear that *damp weather* has no slight share in setting up

the disease under these circumstances; the experiences of Mackenzie,¹ Hunt,² Coates,³ Cumming,⁴ Taupin and others in foundling institutions, orphanages and hospitals tell that way.

"La stomatite," says Taupin, "se développe de préférence dans le printemps et l'automne, que quelquefois l'hiver; on ne la voit guère en été, à moins que cette saison ne soit humide et un peu froide. . . . Dans les hivers comme dans les automnes secs on en observe bien moins de cas que dans les circonstances contraires; et si, après avoir employé vainement un grand nombre de remèdes, on abandonne les maladies à elles-mêmes, on les voit souvent se modifier avantageusement quand le temps, qui était humide, devient sec."

Further, there is complete immunity among the authorities as to the decided influence of *defective hygiene* on the origin and diffusion of the malady in childhood; wherein we should include, on the one hand, damp, filthy, overcrowded and badly ventilated rooms with an atmosphere always tainted with decomposing exuviae of men and animals, and, on the other hand, insufficient amount or bad quality of food. This is the reason why putrid mouth occurs almost exclusively among the children of the poor, or in other words, why these furnish the major part of all the admissions into hospitals with stomatitis ulcerosa; defective hygiene is also the reason why there are epidemics of it in the hospitals and other confined places above mentioned.

"My patients," says Bohn, "came, with few exceptions, from the proletariat and the lower working class;" and he refers to similar statements by Taupin, who has had very great experience in this department of children's disease, and whose words deserve to be quoted here: "J'ai dit que la stomatite se développait de préférence chez les enfants des pauvres. Cette prédilection ne pouvait tenir qu'aux mauvaises conditions hygiéniques dans lesquelles ils se trouvent placés. Ainsi j'ai pu constater dans plus des neuf dixièmes de mes observations que les sujets étaient mal logés, mal vêtus, mal nourris. Quelquesuns logeaient dans des garnis où ils étaient entassés par cinq ou six, sur un peu de paille sale et humide; d'autres n'avaient pas d'asile et avaient été ramassés par la police sous des arches de pont, dans des fours à plâtre. Ceux-ci sont couverts de haillons, ne portent pas de chemise ou en changent fort rarement, et sont dévorés de vermine de toute sorte.

¹ 'Lond. Journ. of Med.,' 1852, Dec.

² 'Rev. méd.-chirurg.,' 1844, Févr.

³ 'North American Med. and Surg. Journ.,' 1826, ii, 1.

⁴ 'Dublin Hosp. Reports,' 1827, iv, 330.

Ceux-la ne vivaient que de pommes-de-terre ou cherchaient leur vie dans les ruisseaux ou les tas d'ordures. Le plus souvent, un même individu présentait toutes ces conditions réunies."

Taupin's picture of the state of the hospital ward under his charge, where putrid-mouth broke out among children admitted for other diseases mostly surgical, comes as near the ideal of neglect as hospital management can attain to; and he adds: "la salle bien saine des garçons n'offre que très-peu de cas de stomatite, tandis que la salle malsaine destinée aux filles en présente un assez grand nombre."

There is no reason to suppose that this factor in the etiology is anything that has a specifically harmful effect on the organism; clearly it is the mere disorders of nutrition thereby induced that bring with them a predisposition towards the local lesion; and that is also the meaning of the fact that the larger percentage of cases of putrid mouth in children occurs in those who had been reduced and weakened by antecedent exhausting diseases, such as severe pneumonias, acute exanthemata, long continued diarrhœas, malarial cachexia, and the like.

From the fact that it is almost exclusively children who take the disease among the civil population (mostly between the ages of five and ten according to Taupin, while among 84 patients, from the age of one to fifteen treated by Bohn, 67 were over four years and under ten), it may be inferred that the malady is somehow associated with the anatomical and physiological peculiarities of childhood. The theory developed by Bohn is that there is a certain predisposition to the disease in childhood, residing particularly in the gums, a predisposition that is given effect to when some extraneous irritation affecting the mucous membrane of the mouth is added; and that theory will seem all the more tenable when we bear in mind that the malady starts in every case from the free margin of the gum, that it never occurs in children at the breast who have not begun to cut their teeth, that the ulceration spreading along the gum comes to a stop at the intervals where the teeth are wanting, and that most of the cases, as Bohn himself has found, belong to the time of life when the incisors and the anterior molars—corresponding to that part of the gum from which the affection starts—are changing from deciduous to permanent. This predisposition is discovered by Bohn in the *habitual state of hyperæmia*

or chronic inflammation very often present in the gums of children even when the teeth are quite sound, an habitual state which is principally explained by the state of irritation of the gums during dentition and especially during the second dentition. When the strength of the body is unimpaired, this pathological predisposition, says Bohn, is not allowed to prevail; but when the energies are weakened, and at the same time some irritant, derived from the patient's mode of life and directly touching the gums, is added, the chronic inflammatory process will develop farther, or, in other words, it will assume the character of stomatitis ulcerosa. I am not acquainted with any other investigations on the developmental process in putrid mouth, either confirmatory of the theory here expounded or tending to upset it. In any case the theory is worthy of every attention, inasmuch as it has the recommendation of rendering the facts impartially, and of affording an adequate explanation of the morbid process. I must fully support Bohn in one point, namely that, so far as experience hitherto enables us to judge, the stomatitis ulcerosa which occurs in childhood under the circumstances mentioned, is neither dependent upon an *infective process* nor transmitted from person to person by *contagion*.

§ 75. THEORIES OF ITS EPIDEMIC OCCURRENCE AMONG THE MILITARY.

The form of *stomatitis ulcerosa* that has been epidemic among the troops ashore and afloat, has been observed, according to what we have already stated of the history, in the most diverse parts of the world—in Portugal, Spain, France, Belgium, Germany, Turkey, Algiers, Egypt, Cochin China, New Caledonia, and the West Indies. *Climatic conditions* would thus appear to be without influence in determining its occurrence. On the other hand, a dependence on *weather influences* comes out more or less decidedly; although there is this difference between the putrid mouth of childhood and the disease among the land or sea forces, that whereas the former goes mostly with the seasons of cold and wet, the latter is principally found in warm and damp weather or

during heat, as nearly all observers agree (Desgenettes, Montgarny, Payen, Cafford, Léonard, Lagarde, Feuvrier and Maget).

"Presque tous les auteurs, en effet," says Bergeron (l. c. 46), "qui jusqu'ici se sont occupés de la stomatite ulcéreuse des soldats ont signalé ce fait, pleinement confirmé par mes propres observations, que la maladie est beaucoup plus fréquente et qu'elle prend même en général le caractère épidémique, lorsque la saison chaude est en même temps pluvieuse."

But we shall assign a merely subordinate place to heat and moisture as factors in the etiology, if we bear in mind that exceptions to the above rule have been not altogether rare (as at Tours in 1818, and Beaucaire in 1831, when the epidemic began in winter); and that the malady has been limited usually to a single division of the garrison, a single barrack, a single ship-of-war, or a single transport. "Les conditions atmosphériques," as Laveran justly remarks, "qui agissent d'une même manière sur toute une population, n'expliquent pas pourquoi une épidémie se développe dans une caserne sans en franchir les portes."

Strictly speaking there is only a probability that *unhygienic* conditions have some effect in developing putrid mouth among the troops: the evidence being firstly, that both on land and at sea it hardly occurs except among the men (the officers, non-commissioned officers, warrant officers and the like escaping); and secondly, that troops in barracks suffer oftener and more severely than the men quartered in the town. It appears to be an undoubted fact that the disease sometimes clings to particular barracks. In some epidemics the men in one barrack have suffered, while all the rest kept entirely free from it. But the most interesting thing in that connexion is Péchaud's account of the epidemic of 1863 in the garrison of Strassburg: the malady was prevalent in one battalion only, occupying the Caserne Ponts-Couverts, only two or three cases occurring amongst the rest of the regiment quartered in the citadel; the affected battalion having been transferred to Schlettstadt, the epidemic died out in the course of six months; but meanwhile in the third battalion which had previously garrisoned the citadel and had had no cases, the epidemic broke out on its being transferred to the Caserne Ponts-Couverts. To that statement of the facts

Péchaud adds that there was no reason to allege overcrowding of the barracks; and therein he traverses the view of those who, like Alard, Léonard, Blaud, Malapert, Bergeron, Mühlig and others, would lay special stress for the pathogenesis upon overcrowding, want of cleanliness, bad ventilation and other things of that kind in barracks and on board ships-of-war, Bergeron in particular remarking (although it is an error in fact) that stomatitis ulcerosa does not occur at all among the crews of ships-of-war, which are healthier quarters than barracks.

The term "over-crowding," as we know, is a relative one. If we compare the proportion of cubic space to the number of inmates in barracks, and on board ships-of-war on the one hand, and the same proportion in private dwellings on the other, we should be always speaking of overcrowding in the former. But experience teaches us that, if the overcrowding do not exceed a certain limit, no particular harm to the men ensues from it; and we must therefore proceed with all reserve in estimating the value of that factor. But there is a series of observations touching the influence of overcrowding in the production of putrid mouth among the troops, which go to prove both positively and negatively that the disease arises independently of that cause. Among the officers of the French army, who have the same kind of sleeping accommodation as the men and are therefore exposed to the same evil effects of confined space, it is extremely seldom that a case of stomatitis ulcerosa has been seen (Beltz). Moreover, other military surgeons confirm Péchaud in saying that there could be no question of any overcrowding of the barracks at the time of the outbreak; while many surgeons of the French navy have had experiences which incline them to say the same. Catalan is explicit in stating that, when the disease broke out on board the training ship to which he was attached as surgeon, there had been neither overcrowding nor any failure of due cleanliness and ventilation. Of special interest in this connexion are Maget's observations on board a transport during the voyage from Brest to New Caledonia and back; it was impossible to charge the cause of the disease to overcrowding of the 'tween decks; nor did the disease break out during the time when all

the ports and hatches in the ship had to be kept closed as much as possible on account of very tempestuous, cold and rainy weather, being just the time when those on board would be most likely to feel the effect of bad ventilation; but not until they sailed into warmer weather. The most remarkable fact, however, and one that should decide the question at issue, is, that not a single case of stomatitis ulcerosa occurred among the 243 passengers and 413 convicts on the voyage out, nor among the 213 passengers and 136 time-expired convicts on the voyage back to France, nor among the officers, warrant officers and quartermasters. "It is indeed superfluous to point out," says Maget in his report on the subject, "that not a year passes without some transport with drafts for distant colonies being placed in corresponding conditions [*i. e.* comparatively overcrowded]. Has anyone seen epidemics of stomatitis in consequence? Never."

Special emphasis for the etiology of this disease among soldiers has been laid on *defects in the diet*, either in quality or in amount. Desgenettes and Larrey thought that the prevalence of the disease in the French army should be attributed to using snow water. Cafford advocated the idea that a sudden change in the diet of recruits, from their former mostly vegetable food to food that was largely animal, gave rise to putrid mouth, and had more particularly done so in the garrison of Narbonne in 1829. The same opinion was afterwards held by Sagot-Duvauroux with regard to the disease in the navy. On the other hand Bergeron finds that the reason why the disease is prevalent among the French troops is not so much a diet of bad and coarse food, as the insufficiency and monotony of the diet. Against that it has to be said that other surgeons of the French army and navy have seen stomatitis ulcerosa in circumstances where errors of diet were absolutely excluded. Thus Maget points out that on board the transport in which he was surgeon, the convicts had the same diet as the crew, and yet the former escaped the disease. If Bergeron's view were the right one, the malady would be much more frequent and more universal among the French troops than it really is; and he has left out of account also the fact that French soldiers have

suffered from putrid mouth not only in the garrisons at home but also during campaigns in Italy, Spain and Germany, when monotony of diet was entirely out of the question.

Some observers have been led by the markedly local character of the disease to entertain the possibility of its being really due to direct irritation of the mucous membrane of the mouth (or the gums) by smoking or chewing tobacco (Martin-Dupont, Feuvrier and others), or to injuries of the gums from chewing the hard ship biscuit, or to the collection of tartar around the necks of the teeth from neglect to clean them (Mourson and others). In that sense a hypothesis has lately been stated by Catelan, which is highly approved of by Maget, and which connects with Bohn's theory of stomatitis ulcerosa puerilis. It is to the effect that the origin of the malady is directly related to the irritation of the gum caused by *the eruption of the wisdom teeth*. This doctrine is based upon the fact that the malady both among the land and sea forces is chiefly met with in recruits, whose age is from eighteen to twenty-two, that is to say, among those who are at the time of life when the physiological event referred to takes place. Catelan also follows Bohn in thinking that the eruption of the wisdom teeth will not give rise to putrid mouth except when the persons concerned are in poor condition, brought about by the exactions of the service, to which they are not accustomed, or by bad or insufficient food. Among Catelan's own cases there were none outside the age of twenty to twenty-one; everyone from twenty-five to forty-five years of age was exempt. Maget, who shares this view as we have seen, had 63 patients whose length of service in the army was as follows: 17 less than one year, 22 between one and two years, 18 between three and four years, and 6 upwards of four years. Catelan finds in his hypothesis an explanation of the fact that stomatitis ulcerosa had not been seen in the French army until the end of last century, when a new mode of recruiting was introduced. Another fact which he thinks his hypothesis can explain is that the disease does not occur among the troops of other Powers such as Prussia, because recruits are admitted by them up to a higher age—which is not correct in fact. It should also be said that the three clinical histories published

by Martin-Dupont relate to patients whose ages were twenty-three, twenty-six and thirty-five; and that Péchaud has seen putrid mouth in young and old soldiers alike, or among those who had served as short a time as three years and as long a time as eight or ten years.

None of these various theories of the *pathogenesis* can be regarded as at all satisfactory if we submit them to an impartial scrutiny, bearing in mind that the disease has been epidemic only in the French army and among the troops of two or three other states, while all the influences that have been put forward as causes of the disease have been present equally among the troops of the other Powers of Europe and North America who have remained free from the malady. Those who inquire into the question will be the more impressed with the openness of it, when they reflect that none of those theories has come near to explaining why stomatitis ulcerosa is not equally common among the adult civil population during that period of life which supplies the largest contingent of the sick among the military; for civilians also are subject to all the influences that have been enumerated. In every country there are barracks comparatively overcrowded and badly ventilated, everywhere we find large masses of the proletariat crowded in small and close rooms; and yet stomatitis ulcerosa has been epidemic nowhere outside a small area. Those who have lived in a seaport know that the sailors and labourers on board ship hardly take the plug of tobacco from their mouths the whole day long; and yet during a good many years' practice in Danzig, where I often attended persons of that class, not a single case of putrid mouth came under my notice. Further, it is in the highest degree improbable that the men of the German, English, Swedish, or Russian forces ashore and afloat practise greater cleanliness or use their tooth-brushes oftener than those of the French, Belgian and Portuguese. The slight importance of neglect to clean the mouth and teeth as a factor in the production of the malady is proved, moreover, by the fact that, on board the training-ship of which Catelan was medical officer, stomatitis became epidemic notwithstanding that the recruits were not only provided with tooth-brushes, but were carefully looked after by the

officers to see that they used them, their teeth being inspected at least once a week. In nearly all other countries as well as France the recruits are mostly from twenty to twenty-one years of age; and there is not the smallest reason to suppose that the duties of the service are less exacting elsewhere than they are in that country.

I consider the question of the true origin of stomatitis ulcerosa among bodies of troops to be for the present unsolved. The only point that seems to me to be beyond doubt is that the disease does not depend on an *infective process*, as Léonard, Malapert, Bergeron and Guépratte (as well as myself at a former period) have assumed. The opinion that putrid mouth is *contagious* or communicable, which was expressed by Payen, Léonard, Brée, Bergeron and Guépratte (and formerly adhered to by me), is not borne out by the experience of Cafford, Colin,¹ Perrier,² Laveran, Mourson, Catelan and Maget, the two last named more especially having made experiments on themselves which produced no effect.

5. *Cancrum oris* (*Noma*, *Cancer aquaticus*, *Cheilokake*).

§ 76. HISTORICAL REFERENCES; GEOGRAPHICAL DISTRIBUTION.

Cancrum oris as a form of disease familiar to practitioners by its proper characters or as differentiated from other morbid conditions of the mouth like it, has a *history* that goes no farther back than the seventeenth century. The medical writings of former periods have been thoroughly explored by Richter,³ Wigand,⁴ Tourdes⁵ and others without disclosing any clear evidence that the practitioners of those times were acquainted with *noma*. It is true that we find them using the word *vouai* (which had been employed by Hippocrates

¹ 'Études cliniques de médecine militaire,' Paris, 1864.

² In the preface to his translation of Pringle's 'Diseases of the Army.'

³ 'Der Wasserkrebs der Kinder,' Berlin, 1828; 'Beitrag zur Lehre vom Wasserkrebs,' ib., 1830; 'Bemerkungen über den Brand der Kinder,' ib., 1834.

⁴ 'Der Wasserkrebs,' Erlangen, 1830.

⁵ 'Du noma, ou du sphacèle de la bouche chez les enfants,' Strasb., 1848.

in the sense of "malignant ulcers") to denote destructive disease of the cheeks, gums or palate; but it is clear that other pathological processes besides *cancrum oris*, such as stomatitis ulcerosa, scurvy and syphilis, are included therein; and any endeavour to unravel the confusion would be in vain. Still it can hardly be doubted that the disease had occurred in long past centuries under the same circumstances as it occurs now. In one of Martial's epigrams¹ entitled "*Epitaphium Canaves*," to which attention has been directed by Heusinger,² there is a description of the signs of disease in a girl who died in her seventh year, which clearly point to *cancrum oris*:

. horrida vultus
Abstulit et tenero sedit in ore lues,
Ipsaque crudeles ederunt oscula morbi,
Nec data sunt nigris tota labella rogis.

The earliest authentic statements on the disease occur in the medical and surgical observations of Fabricius von Hilden,³ bearing the date of 1611; but it was an Amsterdam practitioner named Battus⁴ who first treated of *cancrum oris* at length; and he was followed by several countrymen of his own (v. d. Voorde,⁵ Muys,⁶ van Swieten⁷ and others), and by French and English writers. Despite this exact connotation of the term "*noma*," the disease has been often confounded with stomatitis ulcerosa down to the present day, those cases of putrid mouth which go on to gangrene having given rise to that confusion more especially.

Noma is one of the rarest of diseases; so much is this the case that many very busy and experienced practitioners have never seen it. That is the explanation of *cancrum oris* being mentioned in only a few of the medico-topographical writings; none the less we have data as to its *geographical distribution* which leave no doubt that it occurs all over the world, that subtropical and equatorial countries are by no

¹ Lib. xi, epigr. 91, ed. Schneidewin, ii, 504.

² In '*Janus*,' new series, i, 127.

³ '*Observ. et curat. chir.*,' Cent. I, obs. 30, Opp. Freft., 1846, 28.

⁴ '*Handboek der Chirurgy*,' Amsterd., 1620, 315.

⁵ '*Nieuw lichtende Fakkel der Chirurgie*,' Middelb., 1680, iii, 539.

⁶ '*Prax. chir. rat.*,' Dec. II, obs. 10, Lugd. Batav., 1683, 39.

⁷ '*Comment. in Boerh. Aphor.*,' § 423, 432, i, 750 ff.

means exempt from it, as has been often alleged, and that its existence is quite independent of *climatic influences*, as we may learn by the accounts from Greece,¹ Corsica,² Persia,³ India,⁴ China,⁵ Polynesia,⁶ Algiers,⁷ the Gold Coast of Africa⁸, and the Southern States of the American Union.⁹ Nor is it easy to make out any influence of *weather-conditions* upon the origin of the malady. Tourdes is of opinion that cold and wet weather materially furthers its development, and that the largest number of cases happen for the most part in autumn and spring, and the fewest in summer. But among 107 cases with time of occurrence given, which I have collected from the literature, there were 24 in winter, 26 in spring, 34 in summer and 23 in autumn. According to this, the summer has actually the most; and still more significantly does that season appear to be implicated, by the results of Hildebrandt's¹⁰ statistical inquiry on *cancrum oris*, undertaken at my suggestion, which gave, in a total of 102 cases, 19 in winter, 19 in spring, 42 in summer, and 22 in autumn. To what extent certain *conditions of soil* may affect the frequent occurrence of noma will be considered in the sequel.

§ 77. A DISEASE OF SICKLY CHILDREN; OFTEN AN OUTCOME OF
MALARIAL CACHEXIA OR A SEQUEL OF EXANTHEMATOUS
FEVER.

There are two things that stand out somewhat prominently in the natural history of *cancrum oris*: firstly, its almost

¹ Olympus, 'Correspondenzbl. bayerischer Aerzte,' 1840, 181.

² Vanucci, 'Compt. rend. de l'Acad. de méd.,' 1838, Mai, 29.

³ Polak, 'Wien. med. Wochenschr.,' 1854, Nr. 48.

⁴ Twining, 'Transact. of the Calcutta Med. Soc.,' iii, 351; Voigt, 'Bibl. for Læger,' 1834, i, 281; Raleigh, 'Indian Journ. of Med. Sc.,' 1840, i, 204; Webb, 'Pathologia Indica,' Lond., 1848, 239*, 142; Hinder, 'Med. Times and Gaz.,' 1854, Feb., 154.

⁵ Morache, 'Annal. d'hyg.,' 1870, Janv.

⁶ Boyer, 'Arch. de méd. nav.,' 1878, Septbr., 227, for New Caledonia.

⁷ Bertherand ('Méd. et hyg. des Arabes,' Paris, 1855) for places at the coast; Bazille ('Gaz. méd. de l'Algérie,' 1868, p. 30) for Greater Kabylia.

⁸ Clarke, 'Transact. of the Lond. Epidemiol. Soc.,' 1860, i, 104.

⁹ Dugas ('Southern Med. and Surg. Journ.,' 1850, Oct.) for Georgia.

¹⁰ 'Ueber Noma,' Dissert., Berlin, 1873.

exclusive *limitation to children*; and secondly, the almost absolute dependence of its development upon a *feeble condition of the child's health*. Apart from those extremely rare cases in which noma has appeared in strong and healthy subjects without any discoverable reason,¹ the disease has been oftenest seen during convalescence from severe attacks of acute sickness, including such infective processes as measles, scarlatina, smallpox and typhoid, as well as after pneumonia, and in children who had suffered long from diarrhœa, and most frequently of all as an outcome of the malarial cachexia. The colloquial name of "water-kanker" given to the disease in the Netherlands, serves to show that the people of that country had recognised more than a century ago that a wet or marshy soil had something to do with the causation of the malady;² and the notion finds support not only in the more recent observations from the Netherlands by Thuessink, Thijssen, Büchner, v. d. Oye and others, but also in the experience of many other parts of the world. Thus we are told by Lund,³ who has seen a number of cases of cancrum oris in Stockholm and Schonen, that a protracted intermittent fever had for the most part preceded the outbreak of the disease. Staal⁴ publishes a case of noma that occurred in Stagelse (district of Sorö in Seeland), and adds the remark that the disease at that place, as well as in other marshy districts around the shores of the Danish Islands, is often a sequel of long continued malarial fever. Benedict⁵ gives the marshy situation of the town as a cause of the cancrum oris that is not unfrequently seen in Breslau. Siebert⁶ practised nine years in Halberstadt and treated only one case of noma, which came from a small town subject to annual inundation; but subsequently in Brandenburg, where malaria is endemic, he saw six cases of cancrum oris in the course of three years, all the cases being from places that

¹ Leith Adams ('Edin. Med. Journ.,' 1862, Aug., p. 154) gives an account of a case of that sort in a well-nourished child of five, who had been living under perfectly good hygienic conditions.

² See Leidenfrost, 'De cancro scorbutico,' Groningen, 1782.

³ 'Abhandl. der schwedischen Akademie,' xxvii, 35.

⁴ 'Bibliothek for Læger, 1830,' li, 40.

⁵ 'Rust's Magazin der Heilkunde,' 1835, xlv, Heft 3.

⁶ 'Hufeland's Journ.,' 1811, Dec., p. 83.

were nearly surrounded by water. According to Deutschbein,¹ noma has been seen remarkably often in the marshy neighbourhood of Halle; and the same fact is stated by Weber² for the malarial district of Mülhausen (Alsace), by Jackson³ for Northumberland (Pennsylvania), and by Webb, Voigt, Raleigh, Twining and others for various parts of India.⁴

In such cases, as well as in others where it develops as the sequel of infective diseases, there is nothing specific in the process; it is merely an outcome of nutrition profoundly disturbed by those diseases, which themselves do no more than predispose to the malady. This is proved by the fact that other influences, as we have seen, are in like manner able to set up the disease, influences that act upon the organism in the same way as the former, and most of all upon the organism of the child, which has the smallest power of resistance. We may thus explain, too, the preponderance of noma among the children of the poor, and in badly kept and ill ventilated foundling or lying-in hospitals and hospitals for sick children. Regarding the latter class we have information by Baron⁵ for the Hôpital des Enfants of Paris during a time of overcrowding, by Cliet⁶ for the Lyons lying-in house in 1817, when it was likewise extremely overcrowded in consequence of the prevalent distress throughout the country, by Egerton⁷ for the Children's Hospital of Calcutta at a time when it was densely packed with patients of all sorts, and by Hall⁸ for the prison of Hobart, Tasmania, when it was in a state of filth and overcrowding.

Noma has sometimes occurred in such considerable groups

¹ 'De noma infantum,' Dissert., Halis, 1840.

² 'Gaz. méd. de Strasbourg,' 1844, p. 257.

³ 'American Med. Recorder,' 1827, July, p. 66.

⁴ Edgar ('St. Louis Med. and Surg. Journ.,' 1870, Sept., vii, 398) gives an account of five cases of noma in children and of three in adults, all of which occurred in 1844 at a place in the vicinity of St. Louis; there had been an extensive inundation shortly before, and the drowned animals and putrefying vegetable refuse were left lying on the ground for a long time after the water had subsided.

⁵ 'Buliet. de la Faculté de méd. de Paris,' 1816, 145.

⁶ 'Compt. rend. des observ. rec. dans la salle des Filles-mères . . . de la Charité de Lyon,' Lyon, 1823.

⁷ Quoted by Webb, l. c., 239*.

⁸ 'Transact. of the London Epidemiol. Soc.,' 1865, ii, 85.

of cases under the various circumstances above mentioned, that it has acquired the character of an epidemic. This happened after wide-spread epidemics of measles, at St. Petersburg¹ in 1836, in the Children's Hospital of Stockholm² in 1830, at Lyons³ in 1817, in and around Tilsit⁴ in 1827; also as a sequel of a smallpox epidemic at Teheran⁵ in 1853-54; in a Dublin⁶ hospital in 1837-38, probably connected with typhus; and at Amritsur⁷ in the Punjaub in 1852, during a very malignant epidemic of malarial fever.

¹ Heine, in Schmidt's 'Jahrb. der Med.,' 1838, xvii, 211.

² Nyblæus, 'Svensk. Läk. Sällsk. Hdl.,' 1827, xii.

³ Cluet, l. c.

⁴ Seifert, in Rust's 'Mag. der Heilkde.,' xxxiii, 369.

⁵ Polak, l. c.

⁶ Kennedy, 'Medical Reports, &c.,' Dublin, 1839, 25.

⁷ Hinder, l. c.

CHAPTER IX.

MUMPS.

(*Parotitis epidemica s. polymorpha.*)

§. 78. HISTORICAL REFERENCES ; GEOGRAPHICAL DISTRIBUTION.

Epidemics of inflammation of the parotid gland, known under various colloquial names such as mumps, Ziegenpeter or Bauerwetzeln (German) and oreillons (French), were long ago described in a masterly fashion by Hippocrates,¹ who also pointed out the fact observed by himself in an epidemic on the island of Thasos, that swelling of the testicle may occur in the course of the disease. Both he and all the other Greek and Roman medical writers of antiquity, as well as the mediæval practitioners and those of the modern period, were well acquainted with the difference between epidemic parotitis and the symptomatic inflammatory swellings of the gland. But from all those periods we have extremely little epidemiographical information about the disease ; it is not until the beginning of the eighteenth century that it receives more consideration in the history of epidemic sickness, side by side with the acute exanthemata and whooping-cough.

The references to epidemics of mumps, of which I have made a large collection (although it would add nothing to the scientific interest to go into details here),² as well as the medico-topographical notices of the disease, go to prove that it occurs in *widest diffusion over the globe*, no part of the world being exempt from this strange malady. Besides

¹ *Epidem.*, lib. i, sect. i, ed. Littré, ii, 600.

² A tolerably complete list of the papers on epidemics of mumps from 1714 to 1859 is given in the first edition of this work, vol. ii, pp. 183—186.

what we know of it in the temperate latitudes of both hemispheres, we have numerous accounts of epidemics in the cold zone (Iceland,¹ the Farøe Islands,² Lapland and New Archangel in Alaska),³ as well as subtropical and equatorial regions (Egypt and Arabia,⁴ India,⁵ the Malay Archipelago,⁶ Polynesia,⁷ the West Coast of Africa,⁸ Mexico,⁹ the West Indies¹⁰ and Peru).¹¹

§. 79. EPIDEMIC PECULIARITIES.

Mumps as an epidemic displays many peculiarities in regard to time and place, such as we meet with in the natural history of the acute exanthemata and of whooping-cough. Usually the epidemic lasts only a few weeks or months; sometimes, however, it is prolonged to half a year or more. Between successive epidemics at the same place, there are for the most part intervals of years; but it is not altogether rare for mumps to recur in a locality year after year for some time, or at all events to recur after a brief interval. Very often the epidemic remains confined to one circle, one town, or a small group of villages, or to certain classes of

¹ Schleisner, 'Island undervøgt, &c.,' Kjobenh., 1849, p. 49.

² Account in 'Kongel. Sundhedskoll. Aarsberetning for 1856,' p. 64.

³ Romanowsky, 'Med. Ztg. Russl.,' 1849, p. 153.

⁴ Pruner, l. c., p. 206.

⁵ Don, 'Trans. Bombay Med. Soc.,' 1839, iii, 10; Morehead, 'Clinical Researches on Diseases in India,' Lond., 1856, i, 302; Milroy, 'Trans. Epidem. Soc.,' 1866, ii, 150; Huillet, 'Arch. de méd. nav.,' 1868, Févr., p. 82.

⁶ Waitz, 'On Diseases incident to Children in Hot Climates,' Bonn, 1842, p. 242.

⁷ Wilkes, 'U. S. Exploring Expedition,' iv, 73 (account of an epidemic on Hawaii in 1839); Jarves, 'Hist. of the Sandwich Islands,' Lond., 1843; Turner, 'Nineteen Years in Polynesia,' Lond., 1861, p. 536 (account of the general prevalence of mumps throughout the Samoan Islands in 1851); of its occurrence in New Zealand we have accounts by Thomson, 'Brit. and For. Med.-Chir. Rev.,' 1855, April; and by Tuke, 'Edin. Med. Journ.,' 1863, Sept., p. 227.

⁸ Daniell, 'Sketches of the Med. Topogr. of the Gulf of Guinea,' Lond., 1849, p. 115.

⁹ Heinemann in 'Virchow's Archiv,' 1873, vol. 58, p. 161.

Account for Santa Cruz in 'Sundhedskoll. Aarsberetning for 1859; Ruffz, 'Arch. de méd. nav.,' 1869, Août, p. 139.

¹¹ Tschudi, 'Oest. med. Woch.,' 1846, pp. 661, 695; Smith, 'Edin. Med. and Surg. Journ.,' 1840, July, p. 1.

the inhabitants, particularly to children or to the military, and often to some one division of the latter, or to single buildings such as orphanages, hospitals, workhouses, cadets' quarters or soldiers' barracks; and in like manner it has been seen from time to time on board ships of war. In other instances it has spread gradually until it has covered whole districts and even large tracts of country. Widespread epidemics of mumps of that kind occurred in Southern and Central Italy¹ in 1753, Northern Italy² in 1782, many parts of Sweden³ in 1851 and 1856, Prussian Saxony⁴ in 1825, Schleswig and Holstein⁵ in 1832 and 1833, the departments of Düsseldorf and Treves⁶ in 1835, the Cologne⁷ department in 1841, the island of Martinique⁸ in 1836 and 1839, Canton Zürich⁹ in 1839 and 1864, Denmark¹⁰ in 1854 and 1855, Lower Bavaria¹¹ and Central Franconia¹² in 1857 and 1858, and in almost every part of the quondam Duchy of Nassau¹³ in 1857 and 1859.

Instances of the prevalence of mumps within confined limits are supplied by the following epidemics: prison of New York¹⁴ in 1821, orphanage of Halle¹⁵ in 1837 and of Moscow¹⁶ in 1840, girls' school at Bombay¹⁷ in 1837 and boys' school in 1851, cadets' house of Berlin¹⁸ in 1836 and of Ploen (Holstein¹⁹) in 1876.

¹ Laghi, 'Acta Bonon.' v. p. i, 117; Borsieri, 'Institut. med. Lips.' 1798, iii, 328. See also Corradi, 'Annal. delle epid. occorse in Italia,' iv, 160.

² Borsieri, l. c., 335; Corradi, l. c., 349.

³ Account in 'Svenska Läk. Sällsk. Handl.,' iii, 48. Account in 'Kongl. Sundhetskoll. Berättelse året 1851,' 60; Wistrand, 'Vetensk. Akad. Förhandl.,' 1857, 424.

⁴ Account in Rust's 'Magazin f. Heilkde.,' xx, 570.

⁵ Pfaff, 'Mittheil.,' Jahrg. II, Heft 2, 233, N. F.; Jahrg. I, Heft 1, 22.

⁶ 'Bericht des Rhein. Medic.-Collegiums für das Jahr,' 1835, 41.

⁷ 'Bericht,' ib., 1841, 49.

⁸ Rufz, l. c.

⁹ 'Bericht des Züricher Gesundheitsrathes vom Jahre 1839,' 14, 1864, 123.

¹⁰ Ref. in 'Sundhetskoll. Aarsberetning for 1856,' 17.

¹¹ Egger, 'Jahresbericht des naturw. Vereins in Passau,' 1861, iv, 19.

¹² Majer, 'Bayer. ärztl. Intelligenzbl.,' 1858, 540.

¹³ Menges, 'Nass. med. Jahrb.,' 1863, xix und xx, 415.

¹⁴ Hamersley, 'New York Med. Repository,' 1822, July, 413.

¹⁵ Leitzen in Hufeland's 'Journ. für Heilkde.,' 1838, April, 109.

¹⁶ Panck, 'Hamb. Zeitschr. für Med.,' 1844, xxvii, 1.

¹⁷ Morehead, l. c.

¹⁸ Wolf, 'Pr. med. Vereins-Ztg.,' 1836, Nr. 14.

¹⁹ Lühe, 'Berl. klin. Woch.,' 1879, Nr. 40.

There are very many records of epidemics among the military, particularly in France; such as those of 1759, 1799 and 1848 in the garrison of Marseilles,¹ 1779 and 1877 at Brest,² 1827 at Mont-Louis,³ 1864 at Arras, Douay and Montpellier,⁴ 1866 at Rochefort,⁵ 1876 at St. Germain-en-Laye,⁶ 1877 in a number of French garrisons,⁷ and 1881 at Fontenay⁸ and Toulouse.⁹ From Germany we have a notice of an epidemic among the soldiers of the Heilbronn¹⁰ garrison in 1827; and Bettelheim¹¹ saw the disease in 1883 among the Austrian troops occupying the Herzegovina. Among the Confederate troops in the American War of Secession mumps was prevalent to a great extent; in the first year of the war there were 11,216 cases and in the second year 13,429 cases of inflammation of the parotid known to the army medical officers, inclusive of symptomatic affections of the gland.¹² Lastly we have the epidemics of mumps on board ships-of-war, one of which, described by Noble,¹³ occurred in H.M.S. "Ardent" on a voyage to Monte Video just as she entered the trades; the other references known to me are by Dangaix¹⁴ and Jobard¹⁵ concerning outbreaks of 1859, 1871 and 1873 on board French coolie-ships.

¹ Ressignier, 'Gaz. méd. de Montpellier,' 1850, Mars, 181.

² Ozanam, l. c., 313; Calmette, 'Arch. gén. de méd.,' 1883, Oct., 455.

³ Dogny, 'Mém. de méd. milit.,' 1831, xxxi, 319.

⁴ Rizet, 'Gaz. hebd. de méd.,' 1866, Nr. 6, 94.

⁵ Sallaud, 'Des oreillons, de leur nature, &c.,' Montp., 1868.

⁶ Fournié, 'Mém. de méd. milit.,' 1881, Sept., 509.

⁷ Hatry, ib., 1876, 305; Jourdan, ib., 1878, 53; Servier, ib., 529; Géra-
ib., 561; Granier, 'Lyon méd.,' 1879, Nr. 26, 285.

⁸ Delmas, 'Arch. de méd. milit.,' 1883, Nov., 349.

⁹ Guasco, 'Étude sur une épidémie d'oreillons, &c.,' Paris, 1883.

¹⁰ Pommer, 'Beitr. zur Heilkde.,' i, 53.

¹¹ 'Wien. med. Wochenschr.,' 1883, Nr. 41, 1220.

¹² 'Med. Hist. of the Rebellion,' Circular No. 6, Philad., 1865, p. 127.

¹³ 'Edin. Med. and Surg. Journ.,' 1808, July, p. 304.

¹⁴ 'Epidémie d'oreillons sur des émigrés Hindous transportés d' l'Inde
Antilles,' Paris, 1860.

¹⁵ 'Relation de deux épid. d'oreillons observées sur des émigrants indiens
1871 et 1873,' Paris, 1874.

§ 80. FAVOURED BY COLD AND WET; SUSCEPTIBILITIES AND IMMUNITIES.

Mumps is allied in an unmistakeable way to the acute exanthemata, and particularly to measles, not only in its epidemic type, but also for the reason that its origin and diffusion are on the one hand independent of the kind of soil, of hygiene and of race, and on the other hand bound up with definite circumstances of *season* and *weather*. In 150 epidemics of mumps, for which the date of outbreak is precisely stated, the distribution according to season was as follows :

Winter.....	48	...	Summer	15
Winter and spring	17	...	Summer and autumn	4
Spring	41	...	Autumn	16
Spring and summer	2	...	Autumn and winter.....	7

According to this table, 129 of the epidemics were in the cold months and 21 in the warm ; and the experience is almost universal that the malady has been commonest by far in a time of cold and wet weather. Out of 26 epidemics, we are told, the outbreak was preceded in 21 by cold and rainy weather ; and in the case of several of these it is expressly said that the persons principally affected were those who had by force of circumstances been exposed most to the weather. Some of the epidemics among soldiers afford instances of this, such as that of the garrison of Belle-isle-en-mer, observed by Rochard,¹ that of the troops at Lyons² in 1761, and at Mont-Louis in 1828.

Circumstances of *soil* and of *hygiene* have no significance whatsoever for the origin and spread of epidemic parotitis. And, as the geographical distribution shows, there are no differences discoverable in the amount of the disease among the several *races* : the fact brought forward by Romanowsky that the epidemic of 1843-44 in New Archangel affected the natives only (Aleutes and Kolosk Indians) and entirely spared the Europeans, cannot at all events be accounted for by the differences in nationality. But other or *individual*

¹ 'Journ. de méd.,' 1775, vii, 379.

² Hamilton, 'Lond. Med. Journ.,' 1790, xi, p. 2.

peculiarities have a decided influence on the development of the disease; and that comes out quite especially in the great preponderance of mumps among children, as well as in the numerous epidemics strictly confined to the military. What may be the nature of these peculiarities we are for the present unable to explain. It is a not untenable supposition that it may be an affair of comparative *immunity* acquired by having had the disease once, just as in the acute exanthemata; at all events it is stated in the account of mumps among the Confederate troops in the War of Secession, that the disease was seen in hardly any but those who had not had it before; and Fournié remarks that only one-fifth of the soldiers affected in the epidemic of 1876 at St. Germain-en-Laye had it for the second time.

§ 81. SEARCH FOR THE VIRUS.

The large body of experience¹ on the subject leaves no room to doubt that epidemic parotitis spreads by means of *contagion*; and therein we have a proof of the *infective character* of the disease. Inquiries into the nature of the infective matter have lately been made by Capitan and Charrin,² Boinet,³ and Vedrènes⁴ from the *bacteriological* point of view, but without anything positive resulting. Capitan and Charrin have found spherical and rod-shaped microbes in the blood and saliva of persons suffering from mumps; these were most abundant at the height of the disease and disappeared with its subsidence. The organisms grew in artificial cultivations; but the experiments to infect dogs, rabbits and guinea-pigs with the products of cultivation were without effect. Boinet found the same microbes in the blood of a patient with rheumatic orchitis; he, too, cultivated them, and injected the fluid containing

¹ Duncan, 'Edin. Med. and Surg. Journ.,' 1811, Oct., p. 431 (Edinburgh epidemic of 1810); Leitzen, l. c. (Francke's Orphanage at Halle, 1837); Saltmann, 'Jahrb. für Kinderheilkde.,' 1879, xii, 409 (Breslau epidemic of 1875); Lühe, l. c. (cadets' house at Plön); Ewermaun, l. c. (Danzig epidemic of 1880).

² 'Bull. de la soc. de Biologie,' 1881, 28 Mars, and 1883, 3 Dec.

³ 'Lyon méd.,' 1885, No. 9, p. 285.

⁴ 'Mém. de méd. milit.,' 1882, p. 167.

the microbes into the tunica vaginalis of a rabbit ; whereupon there arose an acute inflammation of the testis, and the animal died in fifteen days.

§ 82. RELATION TO EPIDEMICS OF THE EXANTHEMATA.

Lastly, we have to mention that mumps has not unfrequently been epidemic *along with the acute exanthemata*, particularly often with measles, or has preceded them, or directly followed them. Among the recorded instances collected by myself, I find that coincidence noted twenty-one times—twelve times with measles, eight times with scarlatina, and once with smallpox. But the observations appear to me to be too few to justify us in concluding that there is any genetic connexion between mumps and the exanthemata.

CHAPTER X.

DYSENTERY AND DIARRHŒA.¹

§ 83. COMMON IN ALL PERIODS OF HISTORY.

Dysentery is the clinical name for an inflammatory affection of the mucous membrane of the great intestine and rectum, which runs its course either with fever or without fever, is either catarrhal or fibrinous (*i. e.* diphtheritic), and has among its characters, besides such symptoms as pain, borborygmi, and profuse watery or mucous discharges with tenesmus, more or less of blood in the stools. But, however precise may be the clinical and even the anatomical definition of dysentery, it is hardly possible, from the point of view of epidemiology and etiology, to keep it apart as an object of inquiry by itself, or to separate it from "catarrh of the great intestine." In many individual cases diarrhœa has been observed to pass into dysentery, or dysentery into diarrhœa; and on the large scale, whether as endemic or epidemic, the two morbid conditions of the intestinal mucosa have been so closely associated in their manifestations, that the only way to arrive at a comprehensive view of their historical and geographical position, as well as to obtain a complete insight into the combination of

¹ The diseases of the stomach and intestine that possess a more particular interest in regard to their geography and history are a comparatively small number. The range of our attention is still farther confined by the fact that, for the majority of these diseases, the information about their occurrence in place and time is extremely fragmentary, and, where fine points of diagnosis are concerned, not altogether trustworthy. With maladies of that kind there is hardly any use of attempting to deal from the point of view of this work. There thus remain for me to consider here only diarrhœa and dysentery, cholera nostras and cholera infantum, the intestinal parasites having been already treated of in Volume II.

factors that are more or less closely implicated in their origin, is to take them together.

Our information on the *history of dysentery* goes back to the remotest periods accessible to historical inquiry at all. Dysentery (δυσεντερία) is often mentioned in the Hippocratic collection, and is accurately described along with diarrhœa (διάρροια). Hippocrates himself has indicated in the most definite way the close relation of the diseases to one another in an epidemic.¹ The excellent descriptions of dysentery given by Aretæus,² Celsus³ and Archigenes⁴ more particularly, and next in order by Galen,⁵ Caelius Aurelianus⁶ and other writers of antiquity, together with the references to it in the medical compendiums of the Arabians⁷ and the mediæval practitioners, serve to show that in all those periods dysentery was an important thing in medical practice and well known to the profession, although it cannot be ignored that the example of Galen gradually led "dysentery" to have a wider meaning and to include intestinal fluxes of various kinds. Other evidence that dysentery was very common and widely spread in those times, in association with diarrhœa, is found in the accounts of several of the war-pestilences of antiquity,⁸ and in the notices of pestilence by the mediæval historians and chroni-

¹ 'Epidem.,' lib. i, sect. ii, constitutio ii, ed. Littré ii, 616: "Κατὰ δὲ θίρος καὶ φθινόπωρον δυσεντεριώδεις καὶ τεινεσμοὶ καὶ λευεντεριώδεις, καὶ διάρροιαι χολώδεις, λεπτοῖσι, πολλοῖσιν, ὡμοῖσι καὶ δακνῶδεις" ἔστι δ' οἷσι καὶ ὕδατώδεις." In the 'Aphorisms' (sect. vii, § 76 and 77, ed. c. iv, 604) the words: "ἐπὶ διάρρῳῃ δυσεντερίῃ," and "ἐπὶ δυσεντερίῃ λευεντερίῃ," clearly point to a transition from the one form of disease into the other.

² 'De signis et causis diuturnor. morb.,' lib. ii, cap. ix, ed. Kühn, 153: he mentions the expulsion of longish pieces of membrane (fibrinous exudations) like the intestinal tube, which he took for detached pieces of the intestinal coat itself.

³ 'De medicina,' lib. iv, cap. 15: he describes the disease under the name of "termina," in common use among the Romans.

⁴ In Aetius, 'Tetrabibl.,' iii, sermo i, cap. 43.

⁵ 'De locis affectis,' lib. ii, cap. v, and lib. vi, cap. ii, ed. Kühn, viii, 85, 381; also in 'Comment. ad Hippokr. aphor.,' sect. iv, § 26, e. c. xvii, 13, 691, where the same tubular casts as in note 2 are spoken of as "ramenta ipsorum intestinum derasa."

⁶ 'Morb. chron.,' lib. iv, cap. vi.

⁷ See especially Avicenna, 'Canon,' lib. i, fen. ii, tract. ii, cap. vii.

⁸ There is no doubt that severe diarrhœa and dysentery played a prominent part in the celebrated "plague of Thucydides," which raged at Athens during the Peloponnesian War.

clers, in whom we find mention of no disease, after plague and pestilential fever, more often than of dysentery.¹ From all these references, as well as from the exceedingly numerous epidemiographical accounts by practitioners of the sixteenth, seventeenth, and eighteenth centuries, we may safely conclude that dysentery at all times, just as at present, had the widest diffusion over the globe, that it had exempted no considerable part of the world from a national visitation, that hardly another disease can be placed beside it in that respect, and that we may accept the statement of Ayres,² "Of dysentery it may be said that where man is found, there will some of its forms appear."

§ 84. PRESENT GEOGRAPHICAL DISTRIBUTION.

Throughout that large *area of distribution*, dysentery and diarrhœa exhibit an almost complete correspondence with the malarial diseases in respect to the manner of their endemic prevalence, the frequency of their epidemic outbreaks, and the varying severity of their type. Like the malarial diseases they reach the maximum of diffusion and of intensity, and more especially their greatest severity as an endemic, in equatorial latitudes; in subtropical countries there begins to be noticed a decrease in the extent and seriousness of their endemic and epidemic incidence; while in still higher latitudes they almost disappear as endemic diseases and show themselves merely now and then in epidemics over an area at one time large and another time

¹ See the following references: Gregory, of Tours, and Paulus Diaconus on epidemics of dysentery in France in the years 534 and 538; Saxo Grammaticus (quoted by Ilmoni, 'Bidrag,' i, 26) on the epidemic of dysentery which extended over a great part of the north-east of Europe in 760; in the 'Annal. Francor. Fuld.' (quoted in Freher's 'Rerum Germanorum script.,' i, 820) on the war-dysentery in 820 among the German troops in Hungary; Frank von Wörd, 'Chronik,' 1585, ii, 476, on the pestilence of 1083 and 1113 in Germany; Walsingham, 'Histor. Angl.' (Camden's 'Anglica,' Francof., 1603, p. 108), on dysentery in England in 1316; Bizaro, 'Senat. Popul. Gennens. rer. gest. histor.,' Antrop., 1579, p. 111, on the pestilence of 1330 along the Ligurian coast; and Walsingham, 'Ypodigma Neustriæ' (l. c., p. 571), on the dysentery of 1411 in Bordeaux.

² 'North Amer. Med.-Chir. Rev.,' 1860, Sept., p. 842.

small. In one point they differ from malarial diseases, namely that they attain to higher latitudes of the cold zone, appearing as epidemics in regions that are quite free from malaria.

One of the chief seats of dysentery and diarrhœa is the tropical part of the *West Coast of Africa*. They are disastrously prevalent both among the natives and the European settlers in *Senegambia*, not merely on the coast belt¹ but in the elevated parts of the country as far up as Bakel and Medina;² in the mountainous region of Galam (Kadzâaga) dysentery is epidemic only now and then as a result of famine.³ The *Sierra Leone Coast*⁴ is also severely afflicted with dysentery and diarrhœa. But it is on the coast of *Upper Guinea*⁵ that the diseases reach their maximum, both types being reported as disastrously prevalent not only among the Europeans but also among the indigenous negro race on the Gold Coast,⁶ the Slave Coast,⁷ and the shores of the Niger delta.⁸ The state of matters is better in the Cameroons⁹ and the Gaboon down to Cape Lopez, and best

¹ Thevenot, 'Traité, &c.,' Paris, 1840, pp. 132, 158, &c.; Berville, 'Remarques sur les maladies du Sénégal,' Paris, 1857; Simonot, 'De la dysenterie au Sénégal, &c.,' Paris, 1857; Dutroulau, 'Traité, &c.,' Par., 1861, 10; Chassaniol, 'Arch. de méd. nav.,' 1865, Mai, 511; Béal, 'Considérations sur les malad. observ. au Sénégal,' Par., 1862; Borius, 'Quelques considér. méd. sur le poste de Dagana,' Montp., 1864, and 'Arch. de méd. nav.,' 1882, Avril, 305; Mondot, 'Étude sur le Sénégal, &c.,' Par., 1865, 24; Gauthier, 'Des endémies au Sénégal,' Par., 1865, 16, 27; Thaly, 'Arch. de méd. nav.,' 1867, Mai, 361; Berger, 'Considér. hyg. sur le bataillon de tirailleurs Sénégalais, &c.,' Montp., 1868, 46; Carbonnel, 'De la mortalité actuelle au Sénégal, &c.,' Par., 1873, 32; Hebert, 'Une année méd. de Dagana,' Par., 1880, 19.

² Verdier, 'Étude méd. sur le poste de Bakel,' Par., 1876, 45; Collin, 'Contributions à la géogr. méd. du Haut-Sénégal,' 1883, 46.

³ Thaly, l. c., 1867, Sept., 176.

⁴ Ritchie, 'Monthly Journ. of Med.,' 1852, Mai, 404; Borius, l. c.

⁵ Reynhout, 'Geneesk. Mengelingen,' 1818, Nr. 2, 1; Boyle, 'Account of the Western Coast of Africa, &c.,' Lond., 1831, 379; Bryson, 'Rep. on the Climate and Diseases of the African Station, &c.,' Lond., 1847, 251.

⁶ Clarke, 'Transact. of the Epidemiol. Soc.,' 1860, i, 109; Gardiner, 'Brit. Army Med. Reports for 1863,' 329; Moriarty, 'Med. Times and Gaz.,' 1866, Dec., 663; Donnet, 'Lancet,' 1874, Feb., 227.

⁷ Féris, 'Arch. de méd. nav.,' 1879, Mai, 328.

⁸ Oldfield, 'London Med. and Surg. Journ.,' viii, 403; Trotter, 'Narrative of the Expedition to the River Niger, &c.,' Lond., 1848; Daniell, 'Sketches of the Med. Topogr. and Diseases of the Gulf of Guinea,' Lond., 1849, 53, 95.

⁹ Grifon du Bellay, 'Arch. de méd. nav.,' 1864, Janv., 59; Bestion, ibi., 1881, Nov., 375; Monnerot, 'Considér. gén. sur les malad. endém. observées à l'hôpital

of all on the *Congo Coast* (Lower Guinea) where the endemic centres of dysentery would appear to be merely here and there.¹ On *Fernando Po*² dysentery is worse than in the Gaboon country; several of the *Cape Verde Islands* also (St. Jago and Nicolao) are much subject to it;³ while in *Madeira* it is seen in epidemics only, and more particularly among the poverty stricken inhabitants of the higher inland valleys.⁴ The mortality from dysentery and diarrhœa in Senegambia is estimated at 30 per cent. of the deaths from all causes among the Europeans, and 25 per cent. among the natives. Brunner,⁵ who arrived at St. Louis in 1838 at the end of a destructive epidemic of dysentery, writes: "The first time I went through the streets I was struck by the large number of deadly pale faces among the soldiers of the garrison; 'nous sortons,' I was told, 'd'une épidémie meurtrière de dysenterie;' and in fact one fourth of the men were dead of dysentery, and another fourth creeping about not completely cured and coming back to the hospital from time to time." According to Tulloch in the 'Army Medical Reports,' there were annually 504 admissions and 41·3 deaths per 1000 men due to bowel complaint among the British troops on the Guinea Coast; at Cape Coast Castle (Gold Coast) the mortality from dysentery was 33 per cent. of those attacked by it. Among the black troops in the British service on the Gold Coast and in Lagos, 309 cases of dysentery, with 25 deaths, per 1000 men occurred from 1859 to 1870, giving a mortality of 8·2 per cent. of the sick.

In *Cape Colony* dysentery and diarrhœa take one of the first places among the prevalent diseases,⁶ dysentery being

du Gabon,' &c., Montp., 1868, 36; Abelin, 'Contributions à la géogr. méd. . . du Gabon, Par., 1872, 28.

¹ Moreira, 'Journ. des sc. med. de Lisboa,' xv, 121; Hugiot, 'Montpellier médical,' 1864, Sept., p. 201.

² Quétan, 'Arch. de méd. nav.,' 1868, Janv., p. 73.

³ Lopez de Lima, 'Ensaio sobre a statist. dos possess. Portuguezas na Africa occidentale,' Lisboa, 1844.

⁴ Heineken, 'London Med. Reps.,' xx, 16; Trenton, 'Trans. Med.-Chir. Soc. Edin.,' ii; Kämpfer, 'Hamb. Zeitschr. für med.,' xxxiv, 151; Clymer, 'Amer. Journ. of Med. Sc.,' 1859, Oct., p. 383.

⁵ 'Med. Annual,' 1840, vi, 208.

⁶ Schwarz, 'Zeitschr. der Wiener Aerzte,' 1858, p. 579; Fritsch, 'Arch. für Anat. und Physiol.,' 1867, p. 733.

especially disastrous to the Hottentots and Kaffirs, and becoming more general and more severe the farther one goes from the coast towards the high ground of the interior. For the *East Coast of Africa* and the islands adjacent we have accounts of the two diseases being endemic in *Mozambique*,¹ *Zanzibar*,² *Madagascar*,³ *Réunion*⁴ and *Mauritius*.⁵ It is the more remarkable that dysentery is rare and of a very mild type both in *Mayotte* (Comoro Islands)⁶ and on the small islands of *Nossi-Bé*⁷ and *St. Marie*⁸ situated quite close to the Madagascar coast. According to Tulloch's medical report, the admissions for bowel-complaint among the British troops in Mauritius were 275 per 1000, and the deaths 10·6 per 1000. In Mayotte, as we learn from Dutroulau, dysentery is almost unknown. Referring to Nossi-Bé, Deblenne says that only 33 deaths occurred during the period 1862-80, and that only 4 of these were among the European residents.

Coming to other parts of Africa, we find dysentery and diarrhœa prevalent in *Abyssinia*, equally in the region adjoining the Red Sea,⁹ the deep-cleft mountain valleys, the flat and occasionally swampy banks of the Takazzé and its tributaries, and at a few spots on the plateau, such as Adowa, the chief town of Tigré,¹⁰ whereas they are seldom met with on the open and dry parts of the table-land. According to Currie's¹¹ figures, the admissions for diarrhœa and dysentery

¹ Roquette, 'Arch. de méd. nav.', 1868, Mars, p. 165.

² Semanne, 'Essai d'une topogr. méd. de l'île de Zanzibar,' Paris, 1864; Burton, 'Zanzibar, its City, &c.,' London, 1872; Lostalot-Bachoué, 'Étude sur la constitution phys. et méd. de l'île de Zanzibar,' Paris, 1876, p. 40.

³ Borchgrevink, 'Norsk Magazin for Laegevidensk.,' 1872, p. 238.

⁴ Allau, 'Monthly Journ. of Med.,' No. 8, p. 562; Dutroulau, l. c., p. 50.

⁵ Pellissier, 'Considér. sur l'étiologie des malad. les plus communes à la Réunion,' Paris, 1881, p. 19.

⁶ Allan, l. c.; Power, 'Brit. Army Reports,' 1866, p. 47.

⁷ Dutroulau, l. c., p. 43; Grenet, 'Souvenirs méd. de quatre années à Mayotte,' Montp., 1866.

⁸ Gniol, 'Arch. de méd. nav.,' 1882, Nov., p. 327; Deblenne, 'Geogr. méd. de l'île Nossi-Bé,' Paris, 1883, p. 160; Borius, 'Arch. de méd. nav.,' 1870, Août, p. 81.

⁹ Anbert-Roché, 'Annal. d'hyg.,' xxxiv, 304; Courbon, 'Observ. topogr. et méd. à l'isthme de Suez, &c.,' Par., 1861, 33; Blanc, 'Brit. Med. Journ.,' 1869, March, 255.

¹⁰ Petit, in Lefebure, 'Voyage.'

¹¹ 'Med. Reports of the Brit. Army for 1867,' 295.

among the British troops in the Abyssinian Expedition were 25·75 per cent. of the admissions from all causes, the two diseases standing first among the causes of death. This focus of disease connects on the western side of Abyssinia with the *Soudan* and *Nubia*,¹ one of the worst regions of dysentery in Africa, extending over the whole upper basin of the Nile through Senaar, Kordofan, Darfour, Khartoum and Dongola as far down as the Nubian Desert, and then along the river through *Egypt* to the Mediterranean. There is abundance of confirmation, both by earlier² and later³ observers, of Frank's⁴ statement, "*Morbus post pestem maxime in Ægypto timendus est dysenteria, quae huic climati inhaeret,*" and of the remark by Röser,⁵ that the majority of persons suffering from acute or chronic disease in Egypt die in the end of dysentery, which sets in as a complication. Pruner and Courbon allege that it is least common and least malignant in the coast regions.⁶ The accounts of the endemic prevalence of these diseases in *Algiers*⁷ are very much the

¹ Veit, 'Württbg. med. Correspondenzbl.,' 1839, ix, 105; Russegger, 'Reisen,' i, 202; Pruner, 'Die Krankheiten des Orients,' Erlang., 1847, 202; Peney, 'Arch. für physiol. Heilkde.,' 1853, xii, 373.

² Such as Dewar ('Observations on Diarrhoea and Dysentery . . . in the British Army, &c.,' Lond., 1803); Bruant (in Desgenettes, 'Histoire méd. de l'armée d'Orient,' Par., 1802, ii, 21); Barbes (ib., ii, 53) and Pignet ('Mém. sur les fièvres de mauvais caractère du Levant, &c.,' Lyon, 1804, 30), who wrote on the Egyptian campaign of Napoleon.

³ Clot-Bey, 'Aperçu général sur l'Égypte,' ii, 319; Pruner, l. c., 212; Griesinger, 'Arch. für physiol. Heilkde.,' 1854, xiii, 529; Vauvray, 'Arch. de méd. nav.,' 1873, Sept., 161; Pissas, 'Congrès de médecins Grecs à Athènes, 1882,' Constantin., 1883, 20.

⁴ 'De peste, dysenteria et ophthalmia Egyptiaca,' Vienn., 1820, 181.

⁵ 'Ueber einige Krankheiten des Orients,' Augsb., 1837, p. 24.

⁶ See also the reference in 'Arch. de méd. nav.,' 1869, Mai, p. 324.

⁷ I give here, in alphabetical order of the authors' names, the more important of the very numerous papers on dysentery in Algiers: Antonini, 'Mém. de méd. milit.,' 1839, l, 181; Bédié, 'Essai de topogr. méd. sur Biscara,' Par., 1849; Bertherand, 'Mém. de méd. milit.,' 1842, lii, 164; Broussais, ib., 1846, lx, i; Bruguière, ib., 1844, lvi, 143; Cambay, ib., 1844, lvii, 1; Catteloup, ib., 1845, lviii, 27; Claudot, ib., 1877, Mai, 271; Creissel, ib., 1873, Juillet, 337; Doleau et Ferrus, ib., 1842, lii, 230; Durand-Fardel, 'Revue méd.-chir.,' 1851, Avril, 455; Espanet, 'Journ. des conaiss. méd.-chir.,' 1849, Sept., 91; Finot, 'Mém. de méd. milit.,' 1844, lvi, 1; Fonteneau, 'De la dysenterie observ. en Algérie,' Par., 1857; Froussart, 'Mém. de méd. milit.,' 1847, lxiii, 103; Gaucher, 'Gaz. méd. de l'Algérie,' 1869, Nr. 3; Gondineau, 'Mém. de méd. milit.,' 1842, l, 11; Haspel, 'Maladies de l'Algérie,' Par., ii, 1; Laveran, 'Mém. de méd. milit.,' 1842, lii,

same as those for Egypt. In the unanimous opinion of observers (Catteloup, Haspel and others) the province of Oran is their head-quarters, more than half of the annual effective strength of the troops there suffering from chronic intestinal catarrh or from dysentery; and that enormous prevalence is not confined to the littoral merely, but is likewise noticeable in the higher regions lying on the slope of the Atlas. The least affected province is Alger, where dysentery and diarrhœa are found mostly in the coast districts, more especially on the plain of Metidja, marshy in places, which rises towards the Lesser Atlas, and only exceptionally at the higher points. The province of Constantine takes a middle place between Oran and Alger in respect to the frequency of bowel-complaints; here again it is the coast zone, according to Antonini and Gondineau, that forms the chief seat of dysentery, such localities as Bona, Philippeville, Tchijdhelli and Constantine itself notwithstanding its high situation (Deleau). Among the native population of Greater Kabylia the disease is rare (Claudot); on the other hand it is found in Biskra (according to Quesnoy and Bédié) and in other oases of the province (according to Sériziat).

The extent of these maladies in the several parts of Algeria is shown by the following statistics: In Sidi-bel-Abbès (prov. Oran) there were among the French troops, according to Froussart, 113 deaths due to dysentery or diarrhœa in a total of 229, or nearly 50 per cent. At Tlemcen in the same province, there were 855 cases of bowel complaint among 4500 men (Cambay), and of these 99 ended fatally. Among the troops stationed on the plain of Metidja (prov. Alger) there were 2836 admissions in one year, and of these 906 were for diarrhœa or dysentery (Villette). At Miliana, in the same province, from June to September, 1841, there were 515 cases of these complaints in a total of 1750 admissions (Bruguère).

These diseases are also endemic in the coast-belt of *Morocco*, *Tunis*, and *Tripoli*, although not so malignant as in *Algiers* (Ferrini's¹ statement for *Tunis*). I have no know-

¹ ; *Marseillan*, *ib.*, 117; *Quesnoy*, *ib.*, 1850, nouv. sér., vi, 233; *Rietschel*, *ib.*, 1843, iv, 180; *Sériziat*, 'Gaz. méd. de l'Algérie,' 1872, 140; *Villette*, 'Mém. de méd. milit.,' 1842, liii, 125

¹ 'Saggio sul clima e sullé precipue malattie . . . di *Tunis*,' *Milano*, 1860, p. 173.

ledge how the case stands with regard to the interior of these countries.

The foremost place among the regions of the globe most subject to dysentery and diarrhœa is held beyond question by the countries of *Southern Asia* and the archipelagoes adjacent. But in other parts of Asia as well, such as *Asia Minor*,¹ the coast and valleys of *Syria*,² the plain of *Mesopotamia*,³ and many parts of *Persia* (as I learn by a private letter from Dr. Polack),⁴ endemic centres of the diseases are met with; they occur also in widest prevalence and in severest forms on the western and southern coasts of *Arabia*, whence we have particulars relating to Yembo, Jeddah, Mocha, Ghunfuda, and other places in the Hedjah and Yemen,⁵ as well as Aden⁶ and Muscat,⁷ although the interior of the country would seem to be less subject to the malady.⁸ Also the deep mountain-valleys of *Beluchistan* and *Afghanistan*⁹ are given as endemic seats of dysentery and of malignant intestinal catarrh (the "hill diarrhœa" or "white flux" of English writers, which we shall come to in the sequel).

Howison, in a report from Aden, speaks of dysentery as "the most formidable disease, both as respects its frequency and its dangerous character;" and he goes on to state that in one year (1839) there were 100 cases of dysentery and malignant diarrhœa in a force of 345 British

¹ Erhardt, in 'Hufeland's Journ. der Heilkunde,' 1839, März, p. 114; Branzot, 'Bull. de l'Acad. de méd.,' 1839, Juill., p. 23; Rigler, 'Die Türkei und deren Bewohner,' Wien, 1852, ii, 194; Thirk, 'Oesterr. med. Wochenschr.,' 1846, p. 782.

² Robertson, 'Edin. Med. and Surg. Journ.,' 1843, July, pp. 62-64; Horner, 'Amer. Journ. of Med. Sc.,' 1837, May, p. 259; Tobler, 'Beitr. zur med. Topogr. von Jerusalem,' Berlin, 1855, p. 44; Post, 'New York Med. Record,' 1868, June, p. 149.

³ Floyd, 'Lancet,' 1843, July, No. 4 (relating to Bagdad).

⁴ See also Polack's paper in the 'Zeitschr. der Wien. Aerzte,' 1859, p. 139, on the endemic dysentery of the Persian plateau around Teheran.

⁵ Aubert-Roche, 'Annal. d'hyg.,' xxxi, 23; Courbon, l. c., 67; Buez, 'Gaz. hebdom.,' 1873, No. 17, Feuille.

⁶ Malcolmson, 'Journ. of the Roy. Asiatic Soc.,' viii, 279; Howison, 'Transact. of the Bombay Med. Soc.,' 1840, iii, 79; Steinhauser, ib., 1855, new ser., ii, 233.

⁷ Lockwood, 'Amer. Journ. of Med. Sc.,' 1846, Jan., 84.

⁸ Palgrave, 'Union méd.,' 1866, Nr. 20, 308.

⁹ Thornton, 'Gazetteer of the Countries adjacent to India on North-West Lond., 1844.

troops. Referring to Muscat (south-east coast of Arabia), Lockwood says that it is absolutely fatal for Europeans to pass the summer there by reason of the prevalence of dysentery as well as malarial fever. Hunter¹ and Harthill,² of the English medical service, who made the campaign in 1839 and 1840 from Gundava through the Bolan Pass to Dadar and Kandahar and so to Cabul, thus traversing a great part of Beluchistan and Afghanistan, had abundant opportunities of seeing dysentery and diarrhœa of the worst type among the troops.

But the worst region of endemic and epidemic diarrhœa and dysentery, both as regards prevalence and type, comprises India, Ceylon, Lower India, certain islands of the Malay Archipelago, and the southern and south-eastern coasts of China.

In *India*, as all observers³ agree and all statistics bear

¹ 'Transact. of the Bombay Med. Soc.,' 1840, iii, 146.

² 'Provincial Med. and Surg. Journ.,' 1845, 55.

³ The following is a list of the more important authorities in alphabetical order: Annesley, 'Researches into the Causes of the more Prevalent Diseases of India,' 2nd edit., Lond., 1841, 370; Arnott, 'Transact. of the Bombay Med. Soc.,' 1855, new ser., ii, 200; Aubœuf, 'Études de l'hyg. et des malad. dans l'Inde,' Paris, 1882, 44; Balfour, 'Edinb. Med. and Surg. Journ.,' 1847, July, 33; Bampfield, 'Treatise on Tropical Dysentery, &c.,' 2nd edit., Lond., 1823; Ballingal, 'Pract. Observ. on Fever, Dysentery . . . in India,' Lond., 1823; Bidie, 'Edin. Med. Journ.,' 1857, Oct., 340; Bird, 'Transact. of the Bombay Med. Soc.,' 1840, iii, 90; Brander, 'Transact. of the Calcutta Med. Soc.,' 1829, iv, 382; Breton, ib., 1826, ii, 241; Burke, 'Edinb. Med. and Surg. Journ.,' 1834, April, 386; Burnard, 'Transact. of the Calcutta Med. Soc.,' 1827, iii, 38; Campbell, 'Med. Times,' 1851, Feb., 147; Chevers, 'Ind. Annals of Med. Sc.,' 1855, July, 658; Cornish, 'Madras Quart. Journ. of Med. Sc.,' 1861, Jan., 45; Curran, 'Dublin Quart. Journ. of Med. Sc.,' 1871, Aug., 161, and 'Edinb. Med. Journ.,' 1873, Jan.; Don, 'Transact. of the Bombay Med. Soc.,' 1840, iii, 10; Dunbar, 'India Journ. of Med. Sc.,' 1836, new ser., i, 629; Evans, 'Transact. of the Calcutta Med. Soc.,' 1829, iv, 244; Ewart, 'Indian Annals of Med. Sc.,' 1859, July, 452; Farquhar, ib., 1863, April, 457; Fayrer, 'Lancet,' 1876, Sept., 389; Fleming, 'Brit. Army Med. Reports for 1859,' 224; Forbes, 'Ind. Journ. of Med. Sc.,' 1837, new ser., ii, 191; Geddes, 'Transact. of the Calcutta Med. Soc.,' 1833, vi, 339, and 'Clinical Illustr. of the Diseases of India,' Lond., 1846, 417; Gibson, 'Transact. of the Bombay Med. Soc.,' 1838, i, 68, 1839, ii, 200; Goodeve, 'India Journ. of Med. Sc.,' 1835, new ser., ii, 458; Gordon, 'Med. Times and Gaz.,' 1856, ii, 342 ff; Grant, 'Madras Quart. Med. Journ.,' 1840, ii, 210; Green, 'Indian Annals of Med. Sc.,' 1854, April, 517; Hare, ib., 477; Henderson, 'Edinb. Med. and Surg. Journ.,' 1825, July, 32; Houston, 'Madras Quart. Journ. of Med. Sc.,' 1866, April, p. 303; Hunter, 'Med. Gaz.,' 1847, i, 7, and 'Trans. Bombay Med. Soc.,' 1839, ii, 22; Hutchinson, 'Trans. Calcutta Med. Soc.,' 1831, v, 38; Jackson, ib., 1825, i, 295; Inglis, 'Army Med. Reports,' 1861, p. 358; Ireland, 'Edin. Med. Journ.,' 1863, Jan., p. 615; Kinnis, 'Edin. Med. and Surg. Journ.,' 1851, April, p. 294, July, p. 1, Oct., p. 294; Leslie, 'Trans. Calcutta

out, dysentery and diarrhoea hold the first place among the causes of death, producing a very high absolute mortality (especially in certain regions), or at all events a chronic cachexia which leads sooner or later to death in a direct or indirect way, and carries off an exceedingly large number of victims from among the European residents more particularly. Among the natives, although less frequent in comparison, both diseases are not less fatal. Hutchinson estimates the fatal cases of diarrhoea and dysentery among the sepoys in prisons and military hospitals at three-fourths of the mortality from all causes. Tytler puts the deaths from these diseases among the lower-class natives at the same figure; so that Henderson may well say, "it [bowel-complaint] is perhaps more fatal to natives than all other diseases put together."

The widest endemic prevalence of the disease is in Bengal, the North-West Provinces and Madras. In the two former special mention has to be made of the plains of the Ganges and Jumna (Calcutta, Hoogly, Tirhoot, Burhampoor, Moorshedabad, Meerut, Oudh, Ghazipoor), the province of Orissa, the Assamese districts of Goalpara and Gowhatti in the lower basin of the Brahmapootra, together with the high ground, mountainous in places, which extends from Lower Bengal westwards along the northern frontier of the Central Provinces, and includes Midnapore, Chota Nagpore, and Sum-

Med. Soc., 1833, vi, 51; Lownds, 'Trans. Bombay Med. Soc.,' 1857, new ser., iii, 173; Macpherson, 'Med. Gaz.,' 1841, ii, 546, and 'Indian Annals of Med. Sc.,' 1858, Jan., p. 241; Marshall, 'Edin. Med. and Surg. Journ.,' 1833, Jan., p. 133; Massey, 'Army Med. Reports,' 1859, p. 280; McCosh, 'India Journ. of Med. Sc.,' 1835, ii, 423; McGregor, 'Pract. Observ. on the Principal Diseases in the N.-W. Prov. India,' Calcutta, 1843, p. 83; McKay, 'Indian Annals of Med. Sc.,' 1856, April, p. 546; Morehead, 'Clin. Researches on Disease in India,' Lond., 1856, i, 438; Mouat, 'Trans. Calcutta Med. Soc.,' 1835, vii, 282; Murray, ib., p. 101, and 'Madras Quart. Med. Journ.,' 1839, i, 276, 1840, ii, 213; Parkes, 'Remarks on the Dysentery and Hepatitis of India,' Lond., 1846; Raleigh, 'Trans. Calcutta Med. Soc.,' 1835, vii, 59; Ranking, 'Madras Quart. Journ. Med. Sc.,' 1863, July, p. 44; Staples, 'Army Med. Reports,' 1875, p. 227; Stovell, 'Trans. Bombay Med. Soc.,' 1855, new ser., ii, 62, 1857, iv, 21; Twining, 'Clin. Illustr. of the more important Diseases of Bengal,' 2nd ed., Calcutta, 1835, i, 55; Tytler, 'Trans. Calcutta Med. Soc.,' 1827, iii, p. 1, 1829, iv, p. 375; Voigt, 'Bibl. for Laeger,' 1834, April, p. 341; Waller, 'Trans. Bombay Med. Soc.,' 1859, new ser., iv, 63; Waring, 'Indian Annals of Med. Sc.,' 1856, April, p. 467; Young, 'Trans. Bombay Med. Soc.,' 1839, ii, 211.

bulpore. In the Madras Presidency the worst localities are along the coasts of the central and southern divisions (including Madras itself), as well as on the plains rising from the coast, at many parts of the Western Ghâts, and on the high ground of Secunderabad and Mysore. In the higher districts of the North-West Provinces, as we learn from McGregor, dysentery and diarrhœa are not so common; but there also, just as in the mountainous parts of Bengal and Madras already mentioned, very intense foci are met with on the Himalayan slope, and in elevated parts of the Punjaub. Known under the names of "hill diarrhœa," "white purging," or "white flux," they are the same forms of bowel-complaint that are met with on the Western Ghâts, the Nilghiri Hills and other mountainous regions of India, and that prove so injurious to natives and Europeans, whether in the way of disablement, or sickness, or death.

In the Presidency of Bombay and territories connected with it, diarrhœa and dysentery are less common, being mostly confined to a few points. Thus, we learn from Gibson, Young, Ewart and others that the districts of the Deccan belonging to that Presidency enjoy a relative immunity; also in the peninsula of Gujerât the disease is comparatively rare and less malignant (Gibson, Bird). In the province of Sind, according to Don, Lord, Campbell and others, the conditions are also more favorable, the chief seats of the malady being the delta of the Indus, certain parts of the coast (Kurrachee, according to Inglis), and the shores of the Indus in its lower course, while northwards beyond Bukhar, it occurs for the most part in epidemics only.

As an approximate measure of the number of cases in the several regions of India, I give the following statistics taken from the Army Medical Reports, premising that they relate only to the military, and almost exclusively to the English troops. From 1860 to 1872, the cases of dysentery and severe diarrhœa per 1000 effective men (British and sepoys) were as follows: In Bengal 133·7, in Madras 166·3, and in Bombay 113·8. In Bengal from 1826 to 1832 the annual admissions for dysentery per 1000 men of the English regiments were 205, with a mortality of no more than 8 per cent. of the sick; from 1850 to 1853 the admissions were

123 per 1000, and the mortality among these rose to 11·4 per cent. (Burke and Macpherson). Annesley's figures of the admissions for dysentery (and severe diarrhoea) per 1000 troops in the Madras Presidency are as follows :

Northern Division (Northern Circars)	120
Central "	381
Madras "	472
Southern "	339
Hyderabad (Secunderabad)	360
Mysore	220
Travancore (on the West Coast)	160

In detachments of a British regiment stationed at various places in the Madras Presidency the mean annual admissions for dysentery from 1840 to 1860 per 1000 men were 140, with a death-rate of 8 per cent. of the sick (Ranking). From 1842 to 1859 the admissions for the whole British force in the Presidency were 121 per 1000, of whom 7 per cent. died (Cornil). Balfour's statistics for the period from 1828 to 1838 show the mortality among British soldiers in Madras admitted with dysentery to have been 8·5 per cent., and among sepoy upwards of 10 per cent. According to the army medical report of Kinnis, the annual admissions for dysentery in the Bombay Presidency from 1847 to 1850, were 93 per 1000 men, of whom 9·3 per cent. died. The statement that the malady is more rarely seen in Ahmedabad and vicinity is confirmed by a fact reported by Ewart, namely, that the Mewar Bheel contingent (native troops), numbering nearly 17,000 men, had only 275 cases of dysentery and only 7 deaths over a period of seventeen years.

In *Ceylon* dysentery and diarrhoea are as common and as malignant as in India, especially round the coast and in the valleys of the interior; among the troops the mortality has touched the enormous figure of 23 per cent of the total strength, a ratio which can be matched at very few other parts of the world.¹

The circumstances in which dysentery and diarrhoea occur

¹ See Davy, 'Account of the Interior of Ceylon, &c.,' Lond., 1821; Marshall, 'Notes on the Med. Topogr. of the Interior of Ceylon, &c.,' Lond., 1822; Tulloch, 'Statist. Reports, &c.,' Lond., 1841; Pridham, 'Account of Ceylon, &c.,' Lond., 1849; Cameron, 'Lancet,' 1847, Jan., 74.

in the several islands and archipelagoes of the *East Indies*¹ are peculiar, and of interest for the etiology. First among the regions most subject to these diseases comes Java, of which Bontius,² the earliest writer on medicine in those parts, says: "Terribili isto ac consuetissimo his regionibus malo, quod plures hic homines necat, quam affectus quispiam alius præter naturam." The worst places in the island are Batavia, Bantam, Samarang, Surabaya and other towns on the coast; next to these come the high-lying parts of the country; while the interior plains are less subject. The residencies of Passuruan and Banjuwangi on the east coast have a comparative immunity. According to official returns the mortality from dysentery throughout the whole Dutch East Indies was 7·71 per 1000 of the population in 1855-57, but only 5·6 per 1000 in 1860-65; in Java the deaths from dysentery are estimated at one third of the mortality from all causes; among the Europeans in Samarang the death-rate is 16·2 per 1000, and among the natives 7·7. Next to Java, but less severely than that island, Celebes suffers from endemic dysentery and diarrhœa (Macassar having an exceptional degree of immunity); and it is very malignant in Banka, in the western part of Borneo (Pontianak), in the Lampong country in the south-east of Sumatra, and in the Nicobars. On the other hand the diseases are rarer and of a less malignant type in the Andamans, the Riouw-Lingga

¹ The general authorities are: Bosch, 'De dysenteria tropica,' s'Gravenhage, 1844; Engelbronner, 'Journ. de méd. de Bruxelles,' 1844, Jan., 27; Bleeker, 'La dysenterie obs. au point de vue pathologique, &c.,' La Haye, 1856; Heymann, 'Darstellung der Krankh. in den Tropenländern,' Würzb., 1855, 37; van Leent, 'Arch. de méd. nav.,' 1867, Sept., 168, 1868; Sept., 161; Oct., 247; Dec., 407, 414, 1869; Févr., 86; Sept., 177, 1870; Mars, 173; Juillet, 15, 1871; Avril, 248, 1872; Janv., 9; Févr., 93, 1873; Févr., 100; Juillet, 412, 1877; Févr., 81. Special authorities are: for Java, Junghuhn, 'Topogr. und naturw. Reisen durch Java,' Magdeb., 1845; for Banka: Epp, 'Schilderungen aus Holländ.-Ostindien,' Heidelberg, 1852; for the Moluccas: v. Hattem, 'Nederl. Tijdschr. voor Geneesk.,' 1858, ii, 538; for the Philippines: Lesson, 'Voyage méd. autour du monde,' Paris, 1829, 97; Mallat, 'Les Philippines, &c.,' Paris, 1846; Taulier, 'Arch. de méd. nav.,' 1877, Decbr., 401; Sollaud, ib., 1882, Sept., 166; for the Riouw-Lingga group: Overbeek, 'Nederl. Tijdschr. voor Geneesk.,' 1859, iii, 327; for the Nicobars: Steen-Bille, 'Reise der Corvette Galatea um die Welt,' From the Danish, Leipzig, 1852, i, 244; for the Andamans: Douglas, 'Brit. Army Med. Reports for the Year 1873,' 326.

² 'De medicina Indorum,' Lugd. Batav., 1718, 64.

Archipelago, the Moluccas (quite exceptional in Amboina and Ternate) and Timor. In the Philippines, particularly at Manilla (Luzon) dysentery is moderate in amount and in type.

Connecting in the closest manner with India in regard to the frequency and severity of diarrhoea and dysentery, comes *Lower India*. That applies first and foremost to the coast of British Burmah,¹ including the territories of Chittagong and Arracan; also to the districts of Rangoon, Pegu and Prome in the lower basin of the Irawaddy, to Martaban in the basin of the Salwen, and to the coast of Tenasserim. The peninsula of Malacca² is less severely affected, while Singapore is almost entirely free from bowel complaints, just as it is from malarial fever. According to Waddell's account, more than the half of all the admissions into the hospital of Rangoon in 1824-25 were for dysentery; according to Murchison the number of dysenteric cases there in one year in a body of 487 troops was 228. In Pegu, as Stewart informs us, there were 488 cases of dysentery (84 of them fatal) in a force of 1088 men in 1852-53, besides 156 cases of diarrhoea (9 of them fatal). As regards the immunity of Singapore from dysentery, there is an early statement of Crawford's,³ that the state of health of the town, especially in respect to malarial fever and dysentery, is quite exceptionally good; McLeod⁴ has seen dysentery there in Europeans in merely occasional cases and of a very mild type; Carswell⁵ also has not seen it except in a few strangers who had come from Batavia and had probably acquired the germs of their illness at the latter place; in a sepoy regiment of some 460 men there were 25 cases of dysentery in two years (1828 and 1829), and of these only

¹ Walsh, 'Lond. Med. and Phys. Journ.,' 1829, Feb., p. 110; Waddell, 'Trans. Calcutta Med. Soc.,' 1827, iii, 250; Dawson, 'Philad. Med. Examiner,' 1852, May; Day, 'Med. Times and Gaz.,' 1854, March, p. 231; Murchison, 'Edin. Med. and Surg. Journ.,' 1855, April; Stewart, 'Indian Annals of Med. Sc.,' 1854, April, p. 428; Taylor, *ib.*, p. 419; Arthur, *ib.*, 1856, April, p. 614; Beatson, *ib.*, 1860, Nov., p. 65.

² Ward and Grant, 'Official Papers, &c.,' Pinang, 1830; ref. in 'Madras Quart. Journ. of Med. Sc.,' 1839, i, 411.

³ 'Embassy to the Court of Siam.'

⁴ 'Amer. Journ. of Med. Sc.,' 1846, April, p. 362.

⁵ 'Madras Quart. Med. Journ.,' 1839, i, 72.

one was fatal. These favorable accounts have been confirmed by Armand.¹

One of the most pernicious centres of dysentery is Anam, whence we have details² for the part of the province of Cambodia occupied by the French, and particularly for Saigon. There is hardly another disease in that part of the world that has engaged the attention of French military surgeons so much as the "diarrhœa of Cochin China," the identity of which with the "white purging" of English observers in India and Lower India is beyond question, and about the cause and nature of which there are interesting researches to be referred to in the sequel. Further, all the authorities state that more than one-half of the deaths among the French troops in Saigon are directly due to dysentery and diarrhœa, and that the loss by these diseases is even greater when we keep in mind that many of the patients are invalided home to France and die there. Both diseases are not less prevalent and not less destructive among the native Anamese.

The terminal area of this great endemic territory of dysentery and diarrhœa in their worst forms is reached in the southern and eastern coast-zones of *China*.³ The places

¹ 'Gaz. méd. de Paris,' 1862, Feuille, p. 340.

² I select the following as the most notable, so far as I know, of the legion of papers on "the dysentery and diarrhœa of Cochin China:" Antoine, 'Essai sur la diarrhée eudém. de Cochinchine,' Paris, 1873; Beaufrès, 'Arch. de méd. nav.,' 1882, April, p. 262; Bourgard, 'La dysenterie endém. dans la Cochinchine française,' Montp., 1866; Danguy des Déserts, 'Considér. sur l'hygiène des Européens en Cochinchine,' Paris, 1876; Dounon, 'Descriptions des parasites. . . de la diarrhée de Cochinchine, &c.,' Toul., 1877; Frontgous, 'Considér. sur la dysent. obs. en Coch., &c.,' Montp., 1866; Gayme, 'De la dysent. endém., &c.,' Montp., 1866; Girard la Barçerie, 'Considér. méd. de la Cochinchine,' Montp., 1868, 26; Julien, 'Aperçu sur les lésions anatom. de la dysent. en Cochinchine,' Montp., 1865; Laure, 'Hist. méd. de la marine française, &c.,' Paris, 1864, 38; Lenoir, 'De la diarrhée chron. de Cochinchine,' Paris, 1874; Mesny, 'De la diarrhée chron. en Cochinchine, &c.,' Paris, 1872; Normand, 'Arch. de méd. nav.,' 1877, Janv., 35; Ollivier, 'Observations faites en Algérie, &c.,' Strasb., 1864, 55, 82; Pichez, 'De la dysent. endém. en Cochinchine,' Montp., 1870; Richaud, 'Arch. de méd. nav.,' 1864, Mars, 218; Rochette, 'De les différ. formes de la dysent. en Cochinchine,' Paris, 1866; Roux, 'De l'anguillule stercorale et de son rôle dans l'étiol. de la diarrhée de Cochinchine,' Paris, 1877; Thill, 'Remarques sur les principales malad. de la Cochinchine,' Paris, 1866, 25.

³ Macpherson, 'Madras Quart. Med. Journ.,' 1842, iv, 242; Wilson, 'Medical Notes on China,' Lond., 1849; Traquair, 'Med. Times and Gaz.,' 1854, April,

given as the principal seats of the maladies are Hong Kong (Canton on the mainland being less subject), Amoy, Ningpo, and Shanghai; in Peking also dysentery is prevalent every year to a disastrous extent. From Chusan the accounts are particularly good, the disease having rarely a malignant type there. In China intestinal catarrh has often the character of the ill-reputed "white purging" of India and Lower India. In Hong Kong, according to Macpherson, 224 cases of dysentery and diarrhoea occurred within a short period in a sepoy regiment of 682 men, 45 of the cases being fatal. It is well known what frightful ravages dysentery made among the British troops who were taken up the Yangtse-kiang.

With the islands of the *Japanese Empire*¹ the endemic area of dysentery on Asiatic soil has already come to an end; the disease is merely epidemic there from time to time, and is more malignant in the southern districts, such as the islands of Sikoko and Kiusiu (Nagasaki) than in the northern. Diarrhoea has the same type here as in other temperate latitudes of either hemisphere. In the northern territories of the continent of Asia, dysentery retires still more into the background as a disease of the people, although there are accounts of epidemics of it at Tobolsk (*Siberia*) in 1841, 1855, 1861, and 1863, years that would seem to have been for the most part periods of famine.² In the more recently founded port of Vladivostock in the region of the Amoor no case of dysentery has been seen within the last twenty years, according to the Russian medical officer of the station.³

335; Rattray, 'Edin. Med. Journ.,' 1859, Feb., 705; Rose, 'Pacific Med. and Surg. Journ.,' 1862, Oct.; Smart, 'Transact. of the Epidemiol. Soc.,' 1862, i, 218; Laure, l. c.; accounts in 'Arch. de méd. nav.,' 1866, Juillet, 13, Sept., 162 ff; Morache, 'Annal. d'hyg.,' 1870, Janv.; Duburquois, 'Notes sur les malad. des Européens en Chine et en Japon,' Paris, 1872, 34; Rochefort, 'Arch. de méd. nav.,' 1873, Avril, 241.

¹ Maget, 'Arch. de méd. nav.,' 1877, Mai, 357; Godet, 'Étude sur l'hyg. au Japon,' Paris, 1880, 55; Simmons, 'New York Med. Record,' 1881, Jan., 91; Baelz, 'Ueber die in Japan vorkommenden Infektionskrankheiten,' Yokohama (1881), 5; Sollaud, 'Arch. de méd. nav.,' 1882, Juin, 435; Scheube, in 'Virchow's Archiv,' 1885, Bd. 99, 373.

² Fünér, 'Peterb. med. Zeitschr.,' 1864, vii, 281.

³ Maurin, 'Arch. de méd. nav.,' 1877, Août, 81; Sollaud, *ib.*, 1882, *ib.* 196.

In *Australia* endemic centres of dysentery exist, so far as we have any intimate knowledge of the state of health, at only a few points on the west coast; and in these the type would appear to be somewhat mild.¹ In Melbourne and the country around the disease is often epidemic, but for the most part not pernicious.² It is rarely seen in Sydney;³ and the same holds for *Tasmania*⁴ and *New Zealand*,⁵ although the British troops in the Maori war of 1860-63 suffered much from dysentery.⁶ On the other hand among the *islands of the Pacific* dysentery and diarrhœa again assume the character of diseases endemic at large, although they are far from having that malignancy of type which we have seen to characterise them in the tropical parts of Asia. The more particular accounts come from New Caledonia, where dysentery is given as the single endemic of the country;⁷ also from the Fiji islands,⁸ from Tahiti,⁹ the Mangareva group,¹⁰ and the Hawaiian Islands.¹¹

In the Western Hemisphere, just as in the Eastern, there

¹ Milligan, 'Transact. of the Calcutta Med. Soc.,' 1836, viii, App. ix.

² Clutterbuck, 'Port Philip in 1849,' Lond., 1850; Richardson, 'Edin. Med. Journ.,' 1866, Dec., 525.

³ Lesson, 'Voyage méd. autour du monde,' 112; Baker, 'Sydney and Melbourne,' Lond., 1845.

⁴ Dempster, 'Transact. of the Calcutta Med. Soc.,' 1835, vii, 344; Hall, 'Transact. of the Epidemiol. Soc.,' 1865, ii, 83; Scott, 'Transact. of the Provincial Med. Assoc.,' 1835, iii, App.; Power, 'Dublin Journ. of Med. Sc.,' 1843, March.

⁵ Johnson, 'Dublin Med. Press,' 1843, Nr. 221; Thomson, 'Edin. Med. and Surg. Journ.,' 1850, July, 85.

⁶ Mackinnon, 'Brit. Army Med. Rep. for 1865,' 407.

⁷ Vinson, 'Topogr. méd. de la Nouvelle-Calédonie,' Paris, 1858; de Rochas, 'Topogr. hyg. et méd. de la Nouvelle-Calédonie,' Paris, 1860, 32; ref. in 'Arch. de méd. nav.,' 1866, Janv., 21; Charlopin, 'Notes rec. en Calédonie de 1863 à 1867,' Montp., 1868, 19, 38; Boyer, 'Arch. de méd. nav.,' 1878, Sept., 227; Navarre, 'Étude méd. de la presqu'île Ducos,' Paris, 1879, 28; Cousyn, 'Considér. sur la pathol. . . en Nouv.-Calédon.,' Paris, 1883, 15, 28; Brassac, 'Congrès international des médecins des Colonies, &c.,' Amsterd., 1884, 313.

⁸ Wilkes, 'U. S. Exploring Expedition,' iii, 345; Messer, 'Arch. de méd. nav.,' 1876, Nov., 321.

⁹ Wilson, 'Edin. Med. and Surg. Journ.,' 1806, July, 285; Bennet, 'Lond. Med. Gaz.,' 1831, Dec., ix, 434; Hercouet, 'Étude sur les malad. des Européens aux îles Tahiti,' Paris, 1880, 60.

¹⁰ Lesson, 'Voyage aux îles Mangareva,' Rochefort, 1845.

¹¹ Chapin, 'Amer. Journ. of Med. Sc.,' 1837, May; Gulick, 'New York Journ. of Med.,' 1855, March, 169.

are numerous endemic centres of dysentery and diarrhoea in the equatorial and subtropical regions; although, taken all together, they have not the same importance as those of the Old World, either in their extent or in the severity of their types. In *South America* we come first to French¹ and Dutch² *Guiana* (Cayenne and Surinam), in the former of which the mountainous parts of the interior are more subject to dysentery than the coast-belt. In British *Guiana*, according to Blair,³ the acute forms of bowel-complaint, dysentery in particular, have decreased considerably since the beginning of the century. In *Brazil*⁴ the principal seats of dysentery are the coast-belts of the provinces of Maranhão, Piahy and Parahiba, as well as more considerable tropical areas of the northern and central parts of the country, such as the northern part of the province of Matto Grosso, the flat stream-country of Goyaz, and the province of Para. The provinces to the south (or in higher latitudes), including San Paulo, S. Catarina, Parana, and particularly Rio Grande do Sul, are more free from it, although even in these dysentery is not unfrequently epidemic over a wide area and of a very malignant type.⁵ Allied to these southern provinces as regards the manner of occurrence of dysentery, are *Paraguay*⁶ and the seaboard of the *Argentine Republic*; while in the tropical provinces of the latter, such as Tucuman and Salta, the malady is endemic.⁷ Dysentery and

¹ Segond, 'Journ. hebdom. des sc. méd.,' 1835, No. 6; Laure, 'Considér. sur les malad. de Guayana, &c.,' Paris, 1859, 50; Dutroulau, 'Traité, &c.,' Paris, 1861, 18; Maurin, 'Arch. de méd. nav.,' 1877, Août, 81.

² Schöller, 'Observ. super morbos Surinamensium,' Gött., 1781; Hille in Casper's 'Wochenschr. für die ges. Heilkde.,' 1843, S. 143; v. Leent, 'Arch. de méd. nav.,' 1880, Nov., 405.

³ 'Account of the last Yellow Fever Epidemic of British Guiana,' London, 1852, p. 21.

⁴ See Saulnier, 'Revista med. flumin.,' 1842, Junio; Pleasants, 'Amer. Journ. of Med. Sc.,' 1842, July; Sigaud, 'Du climat et des maladies du Brésil,' Paris, 1844, pp. 116, 204, 337; Rendu, 'Étude topogr., méd. et agronomique sur le Brésil,' Paris, 1848, p. 67.

⁵ Rey ('Arch. de méd. nav.,' 1877, Janv., p. 29) makes mention of severe epidemics of that kind in S. Catarina in 1849, 1851 and 1861.

⁶ Mantegazza, 'Lettere med. sulla America meridionale,' Milano, 1860-63, i, 289.

⁷ *Ib.*, ii, 80, 208.

diarrhœa are indigenous also to the coast of *Chili*,¹ particularly to Valparaiso and La Serena (Coquimbo), which have an almost tropical climate, although they are within the temperate latitudes.² This focus of disease extends upwards along the coast of *Peru*;³ but it is in the forest-region on the eastern slopes of the Cordillera, and on the Peruvian pampas and marshy country of the Amazon that dysentery and diarrhœa are severest in that part of the world. In the "puna" and "sierra" regions the two diseases are less common and less malignant, although even there they often occur, and sometimes in a very malignant form at very considerable elevations, as in the country between Tacna, Moquehua, and Arequipa, on the banks of the Tijenani (province of Larecaya) at a height of 8000 feet, in Huanuco, and even the town of Cerro Pasco at a height of 13,000 feet. This area of dysenteric sickness ends with the coast of *Ecuador*,⁴ *New Granada*, and *Venezuela*, for the two last of which I have no particular information.

Dysentery and diarrhœa play a not less prominent part among the endemic diseases of Central America,⁵ including *Panama*,⁶ *Costa Rica*,⁷ *Nicaragua* and the *Mosquito Shore*,⁸ *San Salvador*,⁹ *Guatemala*¹⁰ and *Mexico*. The accounts from Mexico indicate that the diseases are prevalent in almost all parts of the country, however various their

¹ Lafargue, 'Bull. de l'Acad. de méd.,' xvii, 189; Piderit, 'Deutsche Klin.,' 1855, No. 14.

² Duploux, 'Arch. de méd. nav.,' 1864, Août, p. 106, Sept., p. 1878.

³ Hamilton, 'Lond. Med. and Surg. Journ.,' 1832, Aug., p. 73; Smith, 'Edin. Med. and Surg. Journ.,' 1840, Oct., p. 375; 1841, July, p. 152, 1842; April, p. 367; July, pp. 61, 64; Tschudi, 'Oesterr. med. Wochenschr.,' 1846, pp. 413, 695, 727; Whittingham, 'American. Journal of Medical Science,' 1860, Oct., p. 379.

⁴ Galt, *ib.*, 1874, April, p. 396.

⁵ Wagner, 'Beitr. zur Meteorologie und Climatologie von Mittel-Amerika,' Dresden, 1864, p. 24.

⁶ Lidell, 'New York Journ. of Med. Sc.,' 1852, July, p. 78; Buel, 'Amer. Journ. of Med. Sc.,' 1859, Jan., p. 134; Horner, *ib.*, April, p. 361; Duploux, *l. c.*, 1864, Oct., p. 286; Nov., pp. 374, 379.

⁷ Schwalbe, 'Arch. für klin. med.,' 1875, xv, 160.

⁸ Bernhard, 'Deutsche klinik,' 1854, No. 8.

⁹ Guzman, 'Essai de topogr. phys. et méd. de la republ. de Salvador,' Paris, 1869, p. 115.

¹⁰ Bernouilli, 'Schweiz. med. Zeitschr.,' 1864, iii, 100.

climates : as on the Gulf Coast¹ (Vera Cruz being less subject to dysentery than might have been expected²), along the shores of the Rio Grande del Norte³ from Matamoros upwards, on the Pacific coast (Acapulco,⁴ Mazatlan⁵ Guaymas⁶), in the eastern and western "tierra templada" (as at Tepic⁷ at an elevation of 2500 feet on the western slope of the Cordillera), and at places situated from 4000 to 6000 feet above the sea, such as Orizaba,⁸ San Luis Potosi⁹ and Oaxaca,¹⁰ where hardly one of the foreign residents, according to Heinemann,¹¹ escapes an attack of dysentery or diarrhoea. It is not until we reach the Anahuac plateau, and an elevation of 7000 feet or more, that the diseases, in Jourdanet's experience, become less frequent and less malignant.

Among the regions of the Western Hemisphere that are most subject to dysentery (and diarrhoea), the *West Indies* take first place, although it is only in a few of them that the disease reaches the frequency and intensity that it has on the West Coast of Africa or in India and Lower India. Of the larger islands, Cuba and Hayti¹² are its principal seats, Jamaica being less subject to it;¹³ among the smaller islands mention has to be made of St. Thomas,¹⁴ St. Bartholomew,¹⁵

¹ 'Jourdanet, 'Le Mexique et l'Amérique tropicale,' Paris, 1864, 149; Dupont, 'Notes et observ. sur la côte orientale d'Amérique,' Montp., 1868, 42.

² Heinemann, in 'Virchow's Arch.,' 1873, Bd. 58, 177.

³ Ref. in 'Arch. de méd. nav.,' 1869, Juin, 407.

⁴ Girard, 'Relat. méd. de la campagne de la frégate de l'Assas dans les mers du Sud, &c.,' Montp., 1868, 13.

⁵ Ref. in 'Arch. de méd. nav.,' 1864, Nov., 381; Girard, l. c., 18.

⁶ Lucas, 'La frégate à hélice la Victoire à Guaymas et à Mazatlan,' Paris, 1868, 22.

⁷ Celle, 'Hygiène des pays chauds,' Paris, 1848.

⁸ Poncet, 'Mém. de méd. milit.,' 1863, Mars, 208; Thomas, 'Arch. de méd. nav.,' 1866, Oct.

⁹ Uslar, 'Pr. med. Vereins Zeitg.,' 1843, Nr. 26.

¹⁰ Heinemann, in 'Virchow's Arch.,' 1867, Bd. 39, 607.

¹¹ Eucausse, 'Gaz. med. de Paris,' 1839, Nr. 27.

¹² Dupont, l. c.

¹³ Moseley, 'Treatise on Tropical Diseases and on the Climate of the West Indies,' Germ. Ed., Nürnberg, 1790, 171; Sloane, 'Von den Krankh. in Jamaica,' from the Engl., Augsb., 1784, 81; Hunter, 'Bemerk. über die Krankh. der Truppen in Jamaica,' from the Engl., Leipzig, 1792, 164; Lemprière, 'Pract. Observ. on the Diseases . . . in Jamaica,' Lond., 1799, ii, 196.

¹⁴ Barclay, 'Bibl. for Læger,' xiii, 54.

¹⁵ Forstrom, 'Svensk. Läk. Sällsk. Hdb.,' iv, 231.

Guadeloupe (but only Basse-Terre, the Grande-Terre being almost free from it),¹ Dominica,² Martinique,³ St. Lucia,⁴ Barbadoes,⁵ St. Vincent,⁶ and Trinidad.⁷ In the absence of complete statistical returns we have no means of arriving at a definite estimate of the frequency of the malady in the several islands of the group.

North America.—The data of authorities for the *United States* are too few and in most cases too indefinite to afford us a safe conclusion about the position of dysenteric and severe diarrhœal sickness. There are, indeed, a few statements to the effect that dysentery is very frequent in various parts of the Southern and Central States; but it is doubtful how far these are endemic centres of the malady, inasmuch as we are expressly told of other places in the same localities that the disease is not endemic, but only sporadic or occasionally epidemic. Thus Tidyman⁸ says, in his account of the state of health among the negroes of the Southern States: "There is no disease in the autumnal season which prevails more commonly among the blacks than dysentery, and it is very frequently fatal;" and he adds that it often assumes an epidemic character. Evans⁹ writes of a very malignant bowel-complaint, distinctively known as "the diarrhœa of the South," which is, next to dysentery, one of the most destructive diseases of the South-Western States, and

¹ Cornuet, 'Revue méd.,' 1839, Mai, 289; Senelle, 'Arch. de méd. nav.,' 1867, Janv., 62; Carpentin, 'Étude hyg. et méd. du Camp Jacob,' Paris, 1873, 39; Batby-Berquin, 'Notes sur quelques malad. observ. à la Guadeloupe,' Paris, 1873, 32.

² Inray, 'Edin. Med. and Surg. Journ.,' 1848, Oct., 259.

³ Savarésy, 'De la fièvre jaune, &c.,' Naples, 1809, 20, 31, 48, 87; Dutroulan, 'De l'endémie dysentérique à St. Pierre (Martinique),' Paris, 1853; Langellier-Bellevue, 'Essai sur l'étiologie . . . de la dysenterie endémique du St. Pierre,' Montp., 1867; Rufz, 'Arch. de méd. nav.,' 1869, Juin, 431.

⁴ Rollo, 'Obs. on the Acute Dysentery,' Lond., 1786; Germ. ed., Leipzig, 1787; Levacher, 'Guide méd. des Antilles,' Paris, 1840, 39.

⁵ Hillary, 'Observations, &c.,' Lond., 1766; Germ. ed., Leipzig, 1776, 238; Schomburgk, 'History of Barbadoes,' Lond., 1847; Jackson ('Boston Med. and Surg. Journ.,' 1867, July, 448) says that dysentery is now less common in Barbadoes than it used to be.

⁶ Hunter, 'Lond. Med. Gaz.,' 1849, ix, 187.

⁷ McCabe, 'Edin. Med. and Surg. Journ.,' 1818, Nov., 597.

⁸ 'Philad. Journ. of Med. and Phys. Sc.,' 1826, xii, 329.

⁹ 'Charleston Med. Journ.,' 1851, May, vi, 309.

appears to have been most disastrous to the United States troops during the Texan and Mexican war. Writing of the state of health in Central Florida, Little¹ says : " During the summer and fall seasons diarrhoea and dysentery are very prevalent, as might be inferred from the temperature of the weather, and locality of the country." Posey² speaks of the great frequency of dysentery in the interior parts of Georgia ; of South Carolina, Chalmers³ says : " Take away intermittent fever, and there are no diseases commoner than tenesmus and dysentery at that season " (autumn) ; and with special reference to Charleston, Porter⁴ says : " Chronic diarrhoea and dysentery are serious diseases in summer, and all persons affected by them should have a change of climate without delay." Dickson⁵ also speaks of dysentery being very common and often very malignant in North Carolina, and Wright⁶ says the same of it in Fort Gibson, Arkansas. On the other hand, Hammond⁷ would contend that dysentery has not been seen either as an endemic or of a bad type at Fort Jefferson, Tortugas (Florida) ; Heustis⁸ says that it occurs only in epidemics in the central part of Alabama, and Grant⁹ writes that in Memphis (Tennessee) it is mostly sporadic, and only now and then epidemic.

The only means in any degree serviceable for estimating the incidence of dysentery in various parts of the United States are the statistical reports of the health of the troops ;¹⁰ but these do not inform us where the disease is or is not endemic, nor can they be taken without reserve as expressing the state of matters among the civil population. Still they enable us to form an opinion of the greater or less prevalence

¹ 'Amer. Journ. of Med. Sc.,' 1845, July, p. 72.

² 'Trans. Amer. Med. Assoc.,' 1857, x.

³ 'Account of the Weather and Diseases of South Carolina,' Lond., 1776 (Germ. ed., Stendal, 1796, ii, 34).

⁴ 'Amer. Journ. of Med. Sc.,' 1856, Oct., p. 347.

⁵ 'Trans. Amer. Med. Assoc.,' 1860, xiii.

⁶ 'Amer. Med. Intelligencer,' 1841, No. 6, Dec., p. 113.

⁷ 'Amer. Journ. of Med. Sc.,' 1862, Jan., p. 66.

⁸ *Ib.*, 1831, May, p. 93.

⁹ *Ib.*, 1853, July, p. 107.

¹⁰ 'Statistical Report on the Sickness and Mortality in the Army of the U.S., 1839-55,' Washington, 1856; also 'Statist. Report, &c., 1855-9,' *Washington* 1860.

of the malady at the several points where it has been seen. In the following table the returns in most instances are for twenty-one years (1839-59), but in a few they are for somewhat shorter periods :

Table of the Annual Sick-rate and Death-rate from Dysentery among the Military of the U. S. per 1000 men.

Locality.	Period.	Admissions.	Deaths.
Around the Great Lakes	1839-59	28	0'37
Eastward of the Lakes	"	33	—
Utah territory	1857-59	46	0'34
Newport Barracks, Ky.	1847-59	53	2'02
California, northern division	1849-59	56	2'60
" southern "	"	58	2'33
Westward of the Lakes	1839-59	62	0'94
New Mexico	1849-59	65	1'71
Oregon and Washington territories	"	73	0'78
New England seaboard	1839-59	78	0'22
New York Harbour	"	81	2'09
Interior, central and western	"	86	1'14
Carlisle and Alleghany, Pa.	"	92	0'26
Atlantic, central	"	99	0'95
" southern	"	109	0'88
Interior, southern and western	"	125	3'01
Texas, southern	1849-59	146	3'83
" western	"	149	2'50
Interior, southern and eastern	"	176	4'36
Florida, Atlantic side	1839-59	187	3'27
" interior and Gulf-coast	"	213	4'32
Jefferson Barracks and St. Louis ... (mostly recruits).	"	224	3'74

Comparing the figures of this table for the Northern regions east of the Rocky Mountains on the one hand, with those for the Central, Southern and Pacific regions on the other, we find that the sick-rate in the latter group is more than twice, and the death-rate more than thrice as great as in the former ; so that the geographical position, along with the kind of climate dependent thereon,—in other words, the more or less pronounced sub-tropical character of the climate,—is shown to have a decided influence on the frequency and severity of the disease in this part of the world also.

In *British North America* dysentery is one of the rarest of maladies, excepting in Prince Edward's Island¹ and Vancouver's Island,² where it has occurred unusually often under circumstances to be mentioned in the sequel. It is extremely rare in *Greenland*³ also, or at least it has been so in recent times; in the last century it was several times epidemic in that country, particularly in North Greenland, where intestinal catarrh even at the present day is much more common and widely spread than in South Greenland.

Europe.—On European soil endemic dysentery is confined to a few spots, mostly in the southern peninsulas of the continent and islands adjacent. Of the state of matters in *Spain* and *Portugal* I am unable to form an opinion, for want of sufficient and trustworthy data; dysentery is said to be very common in Andalusia, on the table-land of *Estremadura* and *New Castile*, and in *Arragon*; while there are more precise statements for the southern parts of *Galicia*⁴ and *Catalonia*.⁵ In *Gibraltar*⁶ it is neither endemic nor very common; and in *Lisbon* it occurs very much after the same fashion as in the countries of Europe more to the north.

The official mortality returns⁷ for *Italy* enable us to arrive at the amount of dysentery in the several provinces of that country with a certain degree of accuracy.

¹ Hobkirk in 'Dobell's Reports,' 1870, p. 414.

² Reference to Victoria, V. I., in 'Arch. de méd. nav.,' 1877, Août, p. 93.

³ Lange, 'Bemaerkinger om Grönlands Sygdomsforhold,' Kjöbenh., 1864, p. 23.

⁴ Thiéry, 'Observ. de physique et de méd. faites en différents lieux de l'Espagne,' Paris, 1791, ii, 159.

⁵ Cuyinat, 'Mém. de l'Acad. des sc. de Lyon,' 1843-4, p. 3.

⁶ Hennen, 'Sketches of the Med. Topogr. of the Mediterranean, &c.,' Lond., 1830, p. 120. Among the British troops at Gibraltar during the ten years from 1837 to 1846 there was an annual average of 36 cases of dysentery per 1000 men, of which only 3·6 per cent. were fatal.

⁷ 'Statistica delle cause di morte 1881-3,' Roma, 1882-4.

Table of the Sick-rate and Death-rate from Dysentery in Italy, 1881—83.

Province.	Per 10,000 inhabitants.	Per 10,000 deaths.
Lombardy	0·6	21·5
Liguria	0·7	27·2
Latium (Rome).....	0·8	30·0
Venetia	1·0	37·7
Piedmont	1·2	42·2
Marches.....	1·6	57·5
Sardinia.....	1·7	72·6
Emilia	2·0	69·0
Toscana	2·0	64·5
Appulia	2·6	90·5
Campania	3·0	98·9
Umbria ¹	5·0	178·6
Abruzzi ¹	5·9	209·8
Basilicata ¹	7·4	264·9
Sicily ¹	8·1	314·5
Calabria ¹	8·9	272·5

The result of this table is to show that the disease increases from north to south, although not uniformly; that dysentery is rare in Northern and Central Italy; that it is prevalent to a very remarkable extent in the southern provinces and in Sicily, while on the other hand it is comparatively rare in Sardinia. This amounts to a confirmation of the earlier statements on the subject from certain parts of the country, such as Northern Italy, Naples² and vicinity,³ and Sicily.⁴ In *Malta*, according to Tully,⁵ dysentery counts among the "ordinary diseases of the inhabitants, seldom running to fatal terminations;" from the 'Army Medical Reports' we learn that a yearly average of 39 cases per 1000 men occurred among the British troops in the garrison from

¹ Regarding these large figures I have to say that they are tolerably uniform for each of the three years; so that epidemic influences, although they may perhaps help—no epidemics in those parts of Italy are known to me—are, at all events, not the only thing to cause this comparatively large mortality. The uniformity of the figures is rather in favour of the disease being endemic.

² Guislain, 'Lettre médicale sur l'Italie,' Gand, 1840, 12.

³ De Renzi, 'Topogr. e statistica med. delle città di Napoli,' Nap., 1845.

⁴ Irvine, 'Observations upon Diseases, as they occur in Sicily,' Lond., 1810, 80.

⁵ 'Lond. Med. and Phys. Journ.,' 1825, March, 203.

1837 to 1846, of which 4·5 per cent were fatal. Among the British troops in the *Ionian Islands* during the same period the ratios were still smaller, especially in Corfu. Dysentery in *Greece* is indigenous in the Peloponnese, mostly in Argolis, along the course of the Inachus and Eurotas, and on the marshy coast of Messenia and Laconia; north of the isthmus it is found on the plain of *Ætolia*, especially at Missolonghi, as well as on Naxos and Thira of the Cyclades.¹ Of its occurrence in *Turkey*, Rigler² says: "Dysentery is of as much consequence in Constantinople, Roumelia and Asia Minor as it is over the East generally; however destructive a disease it may be in itself, it will appear to be still more so when we take into account all the morbid conditions that follow it, these sequelæ being far from rare in Turkey as elsewhere." Sandwith³ writes of the disease in the northern parts of the country in the same terms; and in *Roumania* it takes the same conspicuous place among the diseases of the people, more particularly on the Danubian plain.⁴

As an endemic malady, dysentery in *France* has no great importance; there are accounts of its comparatively common occurrence in some parts of Guyenne (Valence d'Agen,⁵ Medoc⁶), and of Provence (Marseilles,⁷ Toulon⁸), in the Lyonnais,⁹ Auvergne (Dept. Puy-de-Dôme¹⁰), a few valleys of the Vosges,¹¹ the marshy districts of the Brenne¹² and

¹ Röser, 'Ueber einige Krankh. des Orients,' Augsb., 1837, 24; Stephani, 'La Grèce au point de vue naturel, &c.' ('Extr. du dictionn. encyclop. du med.'), Par., 1884, 502.

² L. c., ii, 194; also in 'Oester. med. Jahrb.,' 1844, Mai, 184; 'Oester. med. Wochenschr.,' 1846, April, 120, and 'Wien. med. Wochenschr.,' 1859, Nr. 2.

³ 'Assoc. med. Journ.,' 1854, May, 433.

⁴ Tscharnkowsky, 'Bull. du sc. méd.,' xxi, 62; Dobronrawow, in 'Heck's wissenschaft. Anal. der Heilkde.,' xxxi, 341; Tschelyrkin, ib., xxvii, 12; Champagnon, 'Mém. de méd. milit.,' 1868, Mars, 191.

⁵ Guyon, 'Journ. de méd. de Toulouse,' 1844, Juin.

⁶ Le Gendre, 'Étude sur la topogr. méd. du Medoc,' Par., 1866, 37.

⁷ Raymond, 'Hist. de la soc. de méd. de Paris,' ii, Mém., 129.

⁸ Barthonye, 'Rec. d'observ. de méd. des hôpit. milit.,' i, 152.

⁹ Marny et Quesnois, 'Topogr. et statist. méd. du Dpt. du Rhône, &c.,' Lyon, 1866, 120, 547.

¹⁰ Peghous, 'Journ. gén. de méd.,' xcix, 228.

¹¹ Jadelot, 'Hist. de la soc. de méd. de Paris,' i, Mém., 92; Didelot, ib., ii, 37; Georgeon, 'Considér. sur l'hyg. dans les campagnes de la partie montagneuse des Vosges,' Strasb., 1863, 30.

¹² Hellaine, 'De la Brenne au point de vue médicale,' Strasb., 1869, 9.

Sologne,¹ and the Canton Guer, Dept. Morbihan (Vendée).² There is no mention of its being endemic in *Switzerland*, nor in *Belgium* (where epidemics of it are much less common than they used to be),³ nor in *Holland*⁴ nor *England*. In the last named, dysentery has always counted among the diseases of rare occurrence; Sydenham⁵ so speaks of it in his reference to the epidemic of 1669 in London; and Baker,⁶ in his account of the malady in London in 1762, says: "Morbi genus hac in civitate novum fere ac nuperis saltem annis inauditum." There are many accounts of the disease being endemic in *Ireland* down to the seventeenth century. Thus Moryson (1601) says: "The inhabitants and strangers are troubled with looseness of the bowels—the country disease"; Boate also writes in 1682: "The looseness does also greatly reign in Ireland, as well among those of the country as among the strangers, wherefore the English inhabitants have given it the name of the country disease"; and lastly, Borlase (1679) says: "The dysentery or flux is commonly called the country disease, and well it might, for it reigns nowhere so epidemically as it doth in Ireland." So that Sydenham was perfectly justified in speaking of the endemic dysentery of Ireland. Even in the present century it has often been seen in epidemics in that country, although we can hardly describe it as being now an indigenous disease; according to the statistics of mortality,⁷ it is most frequent in the province of Munster (landward districts of Cork, Kerry and Limerick), and in Connaught (among the

¹ Boulet, 'Annal. d'hyg.,' 1838.

² Leduc, 'Relat. d'une épidémie de dysenterie, &c.,' Par., 1873.

³ Meyne, 'Topogr. méd. de la Belgique,' Bruxelles, 1865, 200.

⁴ The interesting work by Evers on the distribution of population in Holland ('Bijdrage tot de Bevolkningsleer van Nederland,' s'Gravenhage, 1882), gives statistics of the mortality from dysentery in the several provinces; but these cannot be used for our purpose, inasmuch as the deaths from dysentery are included along with those from diarrhœa, which in turn include the fatal cases of cholera infantum, the latter indeed accounting for 11,251 out of a total of 12,820 deaths from diarrhœa in general.

⁵ 'Observ. med.,' sec. 4, cap. i, op. Genev., 1736, i, 104 (Greenhill's ed., p. 160).

⁶ "De catarrho et dysenter. Londinensi epid.," in his 'Opuscula,' Lond., 1771,

p. 36.

⁷ Wyld, 'Edin. Med. and Surg. Journ.,' 1845, April, p. 261.

peasantry of Galway and Mayo) ; being rarer in Ulster and rarest of all in Leinster.

Neither in *Germany* can it be said that dysentery is properly endemic. In the south-eastern parts of the country it is met with most frequently in Styria,¹ Istria,² and certain districts of Upper³ and Lower⁴ Austria ; in the south-west, Württemberg and the Palatinate ; and in more northern regions, a few mountainous parts of Bohemia,⁵ Upper Silesia⁶ and the Odenwald.⁷ But over the greater part of North Germany, dysentery is very rarely epidemic, and then only as a purely local incident and within very narrow limits. Many writers of the last century and the present, living in the most diverse parts of the country, have called attention to the remarkably rare occurrence of dysenteric epidemics in North Germany.⁸ Thus Vogler,⁹ in referring to the dysentery at Weilburg in 1783, says that nothing had been heard of it there for twenty years ; Hufeland¹⁰ observes that in Weimar fifteen or twenty years may pass without an epidemic of dysentery ; it is so extremely rare in the Saxon Erzgebirge that Neuhof,¹¹ writing on the epidemic at Annaberg in 1828, has to explain that dysentery had not been seen there for ever so long ; Preiss¹² remarks, *à propos* of the epidemic of 1840 in the Warmbrunner, that the disease had not been seen for twenty years before ; Goldschmidt,¹³ writing from

¹ Onderka, 'Oest. med. Jahrb.,' iv, 360 ; Waser, ib., Nst. F., xi, 352 ; Weiglein, ib., 1842, Feb., p. 129 ; Kicker, ib., 1843, Mai, p. 129. See also the reference to epidemics in Styria in a subsequent section.

² Palkley, 'Verhandl. der Wiener Aerzte,' iii, 60.

³ Ref. in 'Oest. med. Jahrb.,' Nst. F., xi, 198.

⁴ Knolz, ib., 1846, iv, 338, 1847, ii, 230 (relating to the districts of Sebenstein and Waidhofen).

⁵ Glückselig, ib., Nst. F., xxiv, 608 ; and Stros, ib., 1845, iii, 233.

⁶ Lorinser, 'Preuss. med. Vereins Ztg.,' 1833, No. 12 ; Deutsch, ib., 1849, p. 153 ; Virchow, 'Mittheil. über die in Schlesien herrschende Typhus-Epidemie,' Berlin, 1848, p. 28.

⁷ Ebel in 'Hufeland's Journ. der Heilkde.,' 1840, Juni, p. 103.

⁸ The instances of dysentery in war-time are naturally not taken in this connexion.

⁹ 'Von der Ruhr,' Giessen, 1747, preface p. 1.

¹⁰ In 'Hufeland's Journ. der Heilkde.,' i, 76.

¹¹ 'Dresdener Zeitschr. für Natur- und Heilkde.,' 1828, v, 361.

¹² 'Die Klimatischen Verhältnisse des Warmbrunner Thales, &c.,' Breslau, 1843.

¹³ In 'Häser's Arch. für die gesamt. med.,' 1845, vii, 304.

Oldenburg, says: "Epidemics of dysentery never occur; here and there a case of a mild type shows itself in the autumn;" in the account of the dysenteric epidemic in Holstein¹ in 1798, it is stated that nothing had been seen or heard of the malady there for thirty or forty years; and Dohrn,² writing from the same province, propounds the question regarding the Ditmarschen as follows: "How comes it that in our part of the country, where everything is so favorable to disorders of the gastric organs, dysentery is rarely seen? For many years [written in 1835] this disease has not occurred once in our locality sporadically, and of epidemic dysentery there is never a word heard." During seventeen years when I was in practice at Danzig (1846-63), the cases of dysentery that came under my observation were quite occasional; in the autumn of 1854, after an epidemic of Asiatic cholera, a few cases occurred together, but they could hardly be called an epidemic.

On the mainland and islands of *Denmark*, dysentery was so common in past centuries that it had a prominent place among the national maladies.³ In more recent times,⁴ and particularly within the present generation, it has been seen merely in a few slight epidemic outbreaks confined to certain localities. Bergman⁵ has given an extremely valuable account of the history and geographical distribution of dysentery in *Sweden*, from which I take the following facts: The disease has been widely epidemic in Sweden from time to time; very often it has remained confined within particular small areas; but at all times there have been certain spots of the country subject to it more than others, such as the provinces of Wermland, Westergötland, the western part of Småland, and most of all the province of Dalarne, in which dysentery had borne the character of a truly endemic malady down to recent times, having lost that repute no longer ago than about the year 1840. Taking one century with another, no part of Sweden has escaped the disease altogether; it has

¹ 'Goth. gelehrte Ztg.,' 1798, No. 85.

² In 'Pfaff's Mitth. aus d. Geb. der Med.,' 1834, N. F., i, Heft 6, p. 32.

³ Salomonsen, 'Udsigt over Kjöbenh. Epidemier,' Kjöbenh., 1854, p. 49.

⁴ Otto, 'Transact. of the Provinc. Med. Assoc.,' 1839, vii, 211.

⁵ 'Om Sveriges Folksjukdomar,' Förste Häftet, Upsala, 1869 (contains in the introduction a complete list of writings upon dysentery in Sweden.)

been least common in Norrland (in the "länen" of Gefleborg, Westernorrland, Jemtland, Westerbotten and Norbotten) or in the most northern districts; next to these come the province of Schonen and the island of Gottland. But on the whole dysentery was much more common and much more widely diffused in Sweden in past centuries and even in the early part of the present century than in recent times.

The following table is compiled from the mortality returns from 1851 to 1860:

Table of Deaths from Dysentery in Sweden per 100,000 inhabitants.

Jönköping (Småland)	395·8	Nerike (Wermland)	23·8
Skaraborg (Westergötland)	255·1	Halland (Skåne)	11·2
Elfsborg	179·2	Stockholm (City)	7·2
Wermland	121·7	Stockholm (Län)	6·6
Göteborg & Bohus (Wester- götland)	92·7	Norrland	6·4
Calmar (Småland)	82·7	Upsala (Upland)	3·4
Östergötland	50·4	Gefleborg (Norrland)	2·8
Gottland	48·7	Westmanland	2·0
Blekinge (Småland)	38·9	Södermanland	0·6
Wexjö (Westergötland) ...	37·1	Malmöhus (Skåne)	0·3
Falun (Dalarne)	34·5	Christianstad (Skåne)	0·0

The last epidemic in Dalarne was in 1839, and it carried off 2043 persons in a population of 138,000, or 1·5 per cent.

In *Iceland*, where dysentery was very common and disastrous in former centuries, mostly it would seem in consequence of famine, it has been seen time after time within the recent period, but for the most part in slight epidemics of a very mild type.¹ In *Russia* there do not appear to be any really endemic centres of dysentery; casual references make mention of its somewhat frequent occurrence in the Baltic Provinces, particularly at Dorpat;² also in the Governments of Novgorod,³ Jaroslav,⁴ Mohilew,⁵ Kischinew⁶ and Samara;⁷

¹ Schleisner, 'Island undersøgt fra et lægevidensk.,' Synspunkt., 1849, 48; Finsen, 'Jagftagelser angaaende Sygdomsforhold i Island,' Kjöbenh., 1874, 22.

² Oesterlen, 'Zeitschr. für rat. Med.,' vii, 253.

³ Bardowsky, 'Med. Ztg. Russl.,' 1850, 172.

⁴ Scholvin, ib., 1848, 322.

⁵ Kleinenberg, ib., 1847, 410.

⁶ Heine, ib., 1845, 80.

⁷ Ucke, 'Das Klima und die Krankh. der Stadt Samara,' Berl., 1863, 201.

but more especially in Transcaucasia,¹ where dysentery is very often prevalent in autumn (although not altogether of a malignant type) in the swampy parts of the Government of Kutais, in Abassia, Mingrelia, Imeretia and the adjoining country.

§ 85. HISTORICAL EPIDEMICS OF DYSENTERY.

When we come to *epidemics of dysentery*, we find that the history shows the same extreme variations, both as regards place and time, which we meet with in the history of the malarial diseases. Very often, and in fact as a rule, the epidemic focus is confined to a single locality, a village or a town, with no extension to the country around. Indeed, the instances are not rare in which the epidemic attacks a single detached establishment, such as a prison, a hospital, a poor's house, a soldiers' barrack, or, under certain circumstances, a ship; while there are either no cases of dysentery outside these, or merely occasional cases. This applies, moreover, not only to those parts of the world where the disease does not occur except now and then, but also to the whole of those great tracts of country in which it is indigenous. More rarely, although still in numerous instances, the epidemic reaches a wider diffusion over a group of localities (country parishes or towns), without, however, showing a definite progression from place to place or falling on all places alike within the affected area. In a third and still more infrequent series of instances, the epidemic befalls large tracts of country, either at once or in succession; and in such cases it is not unusual for it to reappear in them several years in succession, but with no extension to the regions around—an incident that has been decidedly more common in former centuries than of late years. Lastly, a peculiar interest attaches to the very rare event of dysentery breaking out at long intervals in the form of a pandemic extending to great tracts of country or whole regions of the globe and having a duration usually of several years. It is in such instances that the disease reveals striking analogies

¹ Popoff, 'Med. Ztg. Russl.,' 1854, 379; Krebel, *ib.*, 1858, 76; Liebau, 'Petersb. med. Zeitschr.,' 1866, xi, 281.

to the great epidemics of malaria, with which it has the following other points in common: namely, that it then appears in parts of the world that had been quite free from it for many years or for a whole generation, that it continues therein for a number of years as one of the standing diseases of the people, and that, on its subsidence, it is again absent for long periods.

It would take me far beyond the space available in this work if I were to enumerate all the epidemics of dysentery that have become generally known from the sixteenth century to the present day, and of which I have made as complete a catalogue as possible for the sake of the etiological questions that fall to be discussed in the sequel. I must limit myself to speaking briefly (and so far as there are any data) of epidemics belonging to the third and fourth categories of extent as above defined, leaving unnoticed, for reasons to be afterwards given, all those epidemics of "war dysentery" in which the disease had followed the operations of a campaign.

Epidemics of the third group (extending over large tracts of country) have occurred as follows: In the *United States*, 1749-53 (New England), 1773-77, and 1793-98 (the two latter being of greater extent).¹ In *France*, 1749-50 (Picardy, Normandy, Flanders, Artois, Champagne and other northern parts),² and in 1859 over a large part of Southern and Central France.³ In *Switzerland*, 1659, 1726-27, and 1765-66, widely diffused;⁴ also 1743 in the Cantons of Zürich, Aargau, Bern and the Vallais. In *Holland*, 1556⁵ and 1624;⁶ in several provinces of *Belgium*⁷ in 1831; and in

¹ Webster, 'History of Epidemic and Pestilential Diseases, &c.,' Hartford, 1799, i, 241-3, 260, 263-4, 300, 308, 316-7, 327, 332, 346.

² Desmilleville, 'Rec. d'observ. de méd.,' i, 180; Larsé, 'Journ. de méd.,' vol. 78, p. 243; Marteau, *ib.*, vol. 18, p. 42; Navier, 'Lettre sur plusieurs malad. popul. &c.,' Paris, 1753; Boucher, 'Méthode pour traiter la dysenterie, &c.,' Lille, 1757.

³ Pineau, 'Considér. sur une mode de traitement de la dysenterie epidem.,' Strasb., 1863.

⁴ Bonet, 'Mercurius compilat.,' lib. iv, "Dysent.," § 46; Zimmermann, 'Von der Ruhr, &c.,' Zürich (Engl. transl., 2nd ed., 1774).

⁵ Foreest, 'Observ. et curat.,' lib. xxi, obs. 32, 33, 36.

⁶ Beverwijk, 'Schat der Ongezondh.,' i, 70; v. d. Heyde, 'Disc. sur le flux douloureux, &c.,' Gand, 1643.

⁷ Fallot, 'Arch. gén. de méd.,' 1832, Sept.-Oct.; Gouzé, *ib.*, 1832, Nov.

*Luxemburg*¹ in 1863. In *Great Britain*, 1540 over a large part of England,² also 1668-72;³ 1728-30 general in Ireland;⁴ 1758 many parts of England;⁵ 1817-18 over a wide area in Ireland along with typhus (especially in Waterford, Kilkenny, Tipperary and Cork),⁶ and 1824-26 in these localities under the same circumstances.⁷ In *Germany*, 1583, widely spread;⁸ 1666 in Franconia, Hesse, Thuringia and other parts of Central and Southern Germany;⁹ 1676-78 in the Lausitz, Thuringia, Saxony and the Rhine provinces; 1726-28 in Silesia, Saxony, the Mark of Brandenburg, and Thuringia;¹⁰ 1757-59, not dependent on the military operations, in many parts of the country;¹¹ and 1852 generally diffused throughout Baden.¹² In *Sweden*¹³ 1649-52 "over nearly the whole country"; 1736-43 in Stockholm, city and district, Nerike, Wermland, Helsingland, Dalarne, Angermanland and Jemtland; 1749-50, again in wide diffusion; 1770-75 in nearly every province of the country; and in like manner in 1783-85, 1808-11, 1813, and 1838-39. In *Norway*, 1808-10 in the southern districts, at the same time

¹ Journez, 'Journ. de méd. de Bruxelles,' 1864, Mars-Juin.

² Stow, 'Annals,' 581.

³ Sydenham, 'Constit. epid.,' ann. 1669-72; Morton, 'Pyretologia,' App., Genev., 1696, 160; Willis, 'De medicament. operationibus,' sect. iii, cap. iii, Amstelod., 1682, 46.

⁴ Rogers, 'Essay on Epidemic Diseases, &c.,' Dublin, 1734-5.

⁵ Bisset, 'On the Med. Constitution of Great Britain,' Lond., 1762, 48.

⁶ Harty, 'Histor. Sketch of the Contagious Fever, &c.,' Dublin, 1820, 119; O'Brien, 'Observ. on the Acute and Chronic Dysentery of Ireland, &c.,' Dublin, 1822 ('Transact. of the College of Physicians in Ireland,' 1818, ii, 472); Cheyne, 'Dubl. Hosp. Reports,' 1822, iii, 1.

⁷ O'Brien, l. c., 1828, v; McCarthy, 'Edin. Med. and Surg. Journ.,' 1827, April, 289.

⁸ Lebenwaldt, 'Arzneibuch,' Nürnberg., 1695, 20; Cammerarius in Schenk, 'Observ. méd.,' lib. vi, obs. 6, Freft., 1665, 777; Monavius in Scholz, 'Epist. med.,' 247, Hannov., 1610, 455.

⁹ Buddaeus, 'Miscell. méd.-chir.,' Lips., 1733, iii, cons. 22; Zapf, 'Ueber die Natur. der Ruhr,' Weimar, 1766, u. v. a.

¹⁰ Notices in the 'Bresl. Samml.,' 1726 and 1727; Hoffmann, 'Med. rat. system,' vol. iv, p. iii, sect. ii, cap. vii, obs. 8; Glockengiesser, 'Acta med. Berolin.,' Dec., ii, Ann. ix, 68; Marggraff, 'Diss. med. de dysenteria, &c.,' Hal., 1727.

¹¹ Donckermann, 'De dysenteria epid., &c.,' Teutob. ad Rh., 1759; Strack, 'Tract. méd. de dysenteria, &c.,' Mogunt., 1760, u. a.

¹² Ref. in 'Bad. ärztl. Mitth.,' 1854, Nr. 7, 49.

¹³ See Bergman, l. c.

as in Sweden;¹ and 1859 in the districts of Kragerøe, Thelemarken, Bratsberg, Nedenaes, Jarlsberg, Laurvig, Lister and Mandal² (again simultaneously with a Swedish epidemic in Bohuslän, Dalarne and Calmarlän). For *Italy* there is one notice of an epidemic of dysentery which spread over nearly the whole country, in 1787.³

Pandemics.—The first notice of a pandemic diffusion of dysentery over Europe dates from 1538. Fernel⁴ writes of it: "Anno 1538 dysenteriae graves universa Europa tanta ferocitate populabantur, vix ut civitas ulla immunis evaserit." In 1719 there was a second epidemic of dysentery over a large part of the Continent, of which we have accounts from France, the Netherlands, Switzerland, Germany, Denmark, Russia and Hungary.⁵ Of greater extent and longer duration was the epidemic that raged from 1779 to 1783 in France, the Netherlands, England, Germany and Scandinavia. There is an account of its prevalence in France⁶ by Caille, who says that it was "une des épidémies les plus meurtrières qu'on ait encore vu régner en France, si l'on excepte la peste;" it covered nearly the whole country, being most extensive and most malignant in the northern provinces of Brittany, Poitou, Maine, Normandy, Picardy, Flanders and Champagne, less general and of milder type in Franche-Comté, Burgundy and the Lyonnais, while in the southern provinces the cases of dysentery were mostly sporadic. From Holland there are accounts⁷ of the pestilence in 1779 in North Holland, Friesland, Geldern, Liège, (5000 deaths⁸) and

¹ Homan and Hartwig, 'Norsk. Mag. for Laegevidensk,' 1860, ii, Raek. xiv, 217.

² Homan, l. c.; Bakke, ib., 969; Thomesen, ib., 978; Hoff, ib., 985; Söneberg, ib., 1000; Scheen, ib., 1006; Schneiders, ib., 1032; Kjerulf, ib., 1048.

³ See Corradi, 'Annali delle epid. occorse in Italia,' iv, 405.

⁴ 'De abditis rerum causis,' lib. ii, cap. 13, Frankfurt, 1581, p. 215. There is a particular account of this epidemic in Italy, by Brassavolus, 'Comment. ad Hippocr. Aphor.,' lib. vi, Aphor. 52. See also Corradi, l. c., ii, 113.

⁵ Notices in the 'Bresl. Samml.,' 1719; Dillen, 'Acta Acad. Leopold.,' i, obs., 58; Hoffmann, l. c., obs., 12.

⁶ Caille, 'Hist. de la soc. de méd.,' iii, Mém., 32; Durand, ib., iv, Mém., 84; Vetillard, 'Histoire des maladies dysentériques, &c.,' Mans, 1779, 13.

⁷ Ref. in 'Geneesk. Jaarb.,' iii, St. 2, 14; Reus, 'Kort Verhal van de reede Loop, &c.,' Amsterd., 1779; Jacobs, 'Tract. de dysenteria,' Paris, 1784; Gheuns, 'Abhandl. über die epid. Ruhr,' from the Dut. h, Düsseldorf, 1794.

⁸ Meyne, l. c.

Brabant; and it was again widely spread in 1780 and in 1783.¹ In Germany there were epidemics year after year from 1779 to 1782, in Würtemberg, Baden, the Rhine countries, Westphalia, Hesse, Hanover, Brunswick, the Mark, Prussia and Lower Austria;² and the disease was not less general in Denmark³ and Finland. In 1811 a new pandemic outbreak took place in Scandinavia,⁴ Germany, Switzerland and Italy.⁵ In Germany the visitation fell on many districts of Bavaria,⁶ Würtemberg,⁷ the Rhine provinces,⁸ Westphalia,⁹ Mecklenburg,¹⁰ the Mark¹¹ and Saxony.¹² In Switzerland, the Cantons of Zürich and Glarus, and the shores of the Lake of Constance were affected; and the epidemic made all the more stir from the fact that the greater part of the country had been absolutely free from dysentery for many years.¹³

One of the most extensive and malignant of dysenteric pestilences in the central parts of Europe dates from the years 1834-36. In France the disease had shown itself as early as 1834 in many of the northern districts, including those of Brittany and the departments of Maine-et Loire,

¹ Voltelen, 'Pharmacologia,' iii, 64, iii, 222; van Gherst, 'De dysenteria,' Rotterdam, 1780; van der Haar, 'Auserl. med.-chir. Abhandl.,' ii; Kraijenhof, 'Diss. sist. descriptionem dysenteriae Neomagensis, &c.,' Harderov., 1784; Sebastian, 'Diss. de causa dysenteriae verminosae,' Duisb. ad Rh., 1784; v. Gheuns, l. c.

² Birnstiel, 'De dysenteria liber, &c.,' Mannh., 1786; Mursinna, 'Beob. über die Ruhr,' Berlin, 1787; Wagner, 'Med. Wochenbl.,' 1783, 735; Metzger, 'Verm. med. Schriften,' Königsb., 1782, ii, 169; Auenbrugger in Mohrenheim, 'Beiträge zur Arzneikde.,' ii, 48; Taube in Baldinger, N. Mag., ii, 1; Fritze, 'Med. Annal.,' Leipzig, 1781, i, 81; Lentin, 'Beitr. zur Arzneikde.,' i, 26; Weber, 'Geschichte der Ruhr, u. s. w.,' Tübingen, 1789; Vogler, 'Von der Ruhr,' Giessen, 1797; Diel in Baldinger, N. Mag., vii, 410.

³ Bergman, l. c., 14.

⁴ Bergman, l. c.

⁵ Corradi, l. c., iv, 621.

⁶ Pfenfer in Markus, 'Ephemeriden,' iv, 242; Schäffer, ib., iii, 87; Vend, 'Ueber den Charakter der gegenw. Ruhr-Epidemie,' Würzb., 1811.

⁷ Ref. in Pommer's 'Zeitschr.,' ii, 472; Schübler, 'Jahrb. der deutschen Med.,' iii, 66; Jäger, 'Rhein. Jahrb. der Med.,' i, Heft i, 21.

⁸ Rademacher in 'Hufeland's Journ. der Arzneikde.,' 1811, Dec., 92.

⁹ Dorfmueller, 'Heidelb. klin. Annal.,' viii, 559.

¹⁰ Göden in Horn's 'Arch. der Med.,' 1812, i, 284; Hannius, ib., ii, 139; Helm, ib., 1814, 208.

¹¹ Horn, ib., 1811, Sept.

¹² Schneider, 'Allgem. Annal. der Heilkunst,' 1812, 98.

¹³ Ref. in Pommer's 'Zeitschr. für Heilkde.,' ii, 423, 472, iv, 366.

Indre-et-Loire and Loire infér., and in Toulouse as well. Next year (1835) it was less general; but in 1836 it broke out afresh over a large part of northern, eastern and central France.¹ In Switzerland, where there had been almost no dysentery seen since the epidemic of 1811, few of the Cantons would appear to have kept quite clear of the disease in 1834.² From Belgium also we have a number of references to the prevalence of dysentery in such localities as Heystopdenberg, Brussels, Ghent and Beverloo.³ But it was in Germany, and principally in the south and west, that dysentery in those years acquired a truly pandemic character. The pestilence appeared in certain districts, such as those of Rhenish Prussia, where epidemic dysentery had been a very rare thing for a long time, but where many places now learned, according to what we have already indicated, that one outbreak meant its regular reappearance for a considerable period. Such was the case, according to Sauter,⁴ in the Pinzgau, where nothing had been heard of dysentery since 1807; after the epidemic outbreak of 1834, the malady became prevalent to a greater or less extent year after year. In Baden,⁵ where there had been since 1819 only a few slight epidemics of limited area, dysentery spread in 1834 to every part of the country. It showed first in the central circle of the Rhine, whence it took its course to the lower circle of the Rhine, and at length appeared in the upper circle of the river and in the circle of the Lake of Constance. Taking the cases as officially reported, there were 862 seizures throughout the affected localities, and 114 deaths from the

¹ See the following: Guérin, 'Arch. gén.', 1835, Janv.; Thomas, *ib.*, 1835, April and fol.; Verger and Chauvin, 'Revue méd.', 1835, i, 67, 315, iii, 18; 1837, i, 206; Agnes, 'Rec. de mém. de méd. milit.', xl, 320; Gély, 'Gaz. méd. de Paris,' 1839, No. 2; ref., *ib.*, 1837, No. 3; Marechal, 'Trav. de la soc. des sc. méd. du Dept. de la Moselle,' 1831-8, lxii; ref. in 'Gaz. méd. de Paris,' 1836, p. 89; Bessières, 'Séance publ. de la soc. de méd.,' Toulouse, 1835; Bodinlet, 'Annal. d'hyg.,' 1838, No. 37.

² See the accounts in 'Pommer's Zeitschr.', iii, 104, 209, iv, 116, and in the 'Schweizer Zeitschr. für med.', 1846, p. 204; also Füter, 'Ideen über das Wesen der Nervenfeber,' Bern, 1836, pp. 1-5.

³ Luykx, 'Arch. méd. belge,' 1841, Nov., p. 247; v. Mons, 'Bull. méd. belge,' 1835, Nov., p. 283; Colson, 'Mém. de la soc. de méd. de Gand,' ii; Canstatt,

⁴ 'Hannov. Annal.,' v, Heft 3, 436.

⁵ 'Oesterr. med. Jahrb.,' xvii, 528.

⁶ Fink, 'Med. Annal.,' i, 594; Puchelt, *ib.*, v, 404; Bodinius, *ib.*, vi, 92.

15th July to the 24th October; whereas for the whole country from 1819 to 1833, there were only 557 cases of dysentery reported to the authorities, and of these no fewer than 204 belonged to a considerable epidemic in the sanitary district of Staufen in 1832. In the year following, it reappeared in several parts of Baden, although the cases were fewer; and even in 1836 epidemics of dysentery were seen in a few localities, including Heidelberg and Bretten.

In Würtemberg¹ also, there was a good deal of the sickness in 1834. The following is Hauff's table of the sick-rate and death-rate compiled from the official returns:

Table of Dysentery in Würtemberg in 1834.

Department.	No. of places attacked.	Population of the same.	Cases.	Deaths.
Neckar	49	58,429	9777	1000
Black Forest.....	18	31,967	1773	367
Danube	17	12,396	795	160
Jaxt	15	7,665	777	77

From this it appears that more than one tenth of the population in the affected localities took the disease, and that rather more than 14 in every 1000 inhabitants died. In Sigmaringen the malady was equally common and malignant.² Next year it reappeared in many districts of Würtemberg, which were for the most part those that had escaped the year before.³ In 1836 it was still more prevalent, no circle escaping altogether, while the Danube circle suffered least.⁴ We are unable to say how extensive the epidemic of 1834 became in Bavaria, as there are only casual notices of it from that country.⁵ Its diffusion was at all events very con-

¹ Numerous references in 'Württemb. med. Correspondenzbl.,' iii, iv, v, vi; Bodenmüller in 'Hufeland's Journ. der Heilkde.,' 1842, Jan., p. 70; Rösch in 'Clarus' Beiträge zur Klin.,' ii, 239, and in 'Med. Annual.,' v, 422; Rampold, ib., 169; Hauff, 'Zur Lehre von der Ruhr,' Tübingen, 1836.

² Heyfelder in 'Schmidt's Jahrb.,' viii, 110.

³ Faber, 'Württbg. med. Correspondenzbl.,' vi; Zengerle, ibid., vi, 221.

⁴ Ref., ibid., xi, 149.

⁵ Wensauer, 'Diss. de dysenter. . . in provine. Bavar. sylv.,' Monach., 1835;

siderable; and that is true also of Upper and Lower Austria,¹ of Styria² and of the Tyrol,³ where the sickness was prevalent chiefly in the upper and lower valley of the Inn, in the Pusterthal and in Botzen. In Dalmatia,⁴ only three districts were touched by it, and these only to a moderate extent.

For the north-western parts of Germany there is a lack of particular information on the incidence of the disease. In Rhenish Prussia it was prevalent in 1834 with a universality that had not been known for a long time, being epidemic in some places and sporadic in others, but present everywhere in one form or another.⁵ The year after it showed itself in several districts of the department of Aix-la-Chapelle.⁶ Also in the Kingdom of Saxony it was noticed that dysentery was remarkably common in 1834, and at some places epidemic.⁷ The same "epidemic constitution," although less general, was remarked over no inconsiderable part of the north and east of Germany. Thus in 1834 the sickness was very common and malignant in and around Greifswald.⁸ In the sanitary report of that year for the province of Brandenburg it is stated (p. 112): "Among the diseases that assumed a special importance we have to include dysentery. For a number of years it had not reached such a height as it did in 1834. It showed itself in August in regular epidemic diffusion . . . although not in so disastrous a manner as it did during the same period over nearly the whole of South Germany. No part of the province escaped; it was seen as much in the country as in the towns, and there can have been few villages that were not touched by it." It recurred the year after in every district of the department.⁹ Lastly, the epidemic of 1834

Münsterthaler in 'Hufeland's Journ.,' 1838, Feb., p. 28; Büchner, 'Die vier Grundformen des epid. Krankheitsgenius, &c.,' Erlangen, 1836, p. 61.

¹ Ref. in 'Oest. med. Jahrb.,' xi, 194, xiii, 540; Sauter, *ibid.*, xvii, 528.

² Ref., *ibid.*, xi, 511.

³ Ref., *ibid.*, xi, 361; Ehrharter, *ibid.*, xi, 230, 333.

⁴ Ref., *ibid.*, xiii, 27.

⁵ Bericht des Rhein. med. Colleg., 1834, p. 68.

⁶ *Ibid.*, 1835, p. 37.

⁷ 'Physikatsber. aus dem Königreiche Sachsen,' 1833-4, p. 125.

⁸ Seifert, in 'Hufeland's Journ.,' 1833, Dec., p. 3; Berndt, 'Klin. Mittheil.,' Heft 3-4, p. 161.

⁹ 'Sanitätsber. aus der Prov. Brandenburg, f. d. J. 1835,' 68.

was very considerable in Silesia¹ (particularly in the department of Breslau) and in Galizia.² It was not until 1835 that it broke out in Bohemia, both widely and disastrously,³ and it reappeared at the same time in many parts of Upper and Lower Austria⁴ and Styria.⁵

From 1846 to 1848 dysentery became once more generally prevalent, this time in company with epidemics of typhus. In 1845-46 it had already become quite general in the Baltic Provinces, Livonia, Courland and Esthonia, as well as in Wilna and other parts of the north-west of Russia,⁶ and in Poland.⁷ In 1846 it broke out as a widespread epidemic in many villages of the Belgian provinces of East Flanders, Antwerp and Brabant; the generality of its prevalence may be estimated by the fact that there were 1619 cases and 275 deaths in the four communes of Opdroop, Baesrode, Buggenhout and Moerzeke, with a total population of 11,744.⁸ In 1846-47 it was epidemic in Ireland,⁹ this time chiefly in Ulster and Connaught, and simultaneously in many parts of Scotland and England. From Germany also, in the years 1846-48, there were many accounts of it in the Rhine countries,¹⁰ Hanover and Oldenburg,¹¹ Nassau,¹² the Mark,¹³ Upper Silesia,¹⁴ Pommerania, Bohemia¹⁵ and Galizia.¹⁶

¹ 'Sanitätsber. von Schlesien f. d. J. 1834,' 251.

² 'Oest. med. Jahrb.,' xv, 338; Rohrer, *ibid.*, 1845, iii, 356.

³ *Ref.*, *ibid.*, xv, 178.

⁴ *Ref.*, *ibid.*, xvi, 178, 180.

⁵ *Ref.*, *ibid.*, xv, 3.

⁶ *Ref.* in 'Rigaer Beitr. zur Hlkd.,' i, 533; Löwenstein in 'Med. Zeitschr. Russl.,' 1847, 267; Bardowski, *ib.*, 1850, 172; Steeger, *ib.*, 1852, 120; *Ref.* in 'Med.-chir. Ztg.,' 1846, iii, 252; Fählmann, 'Die Ruhr-Epidemie in Dorpat im 1846,' Dorpat, 1848.

⁷ Oettingen in 'Rigaer Beitr.,' ii, 221.

⁸ Rudder in 'Annal. de la soc. de méd. de Gand.,' 1846, November; Meynne,

⁹ Lalor in 'Dubl. Quart. Journ. of Med.,' 1847, Feb., 38; Mugne, *ibid.*, 1849, also accounts, *ibid.*, 1849, Feb., 64, August, 1.

¹⁰ Bergrath, 'De dysenteria epid. observ.,' Bonn., 1846.

¹¹ Holscher in 'Hannov. Annal.,' vii, Heft 3; Kelp, *ibid.*, Heft 4.

¹² 'Nass. med. Jahrb.,' 1859, xv, xvi, 126.

¹³ Schlesier in 'Pr. med. Vrs.-Ztg.,' 1849, Nr. 20, 21; Weise, *ibid.*, 1851, 2.

¹⁴ Bärensprung in 'Häser's Arch.,' x, Heft 4.

¹⁵ *Ref.* in 'Prager Viertelj. f. Med.,' xxv, 90; Finger, *ibid.*, xxiv, 125; Witowsky, *ibid.*, xvi, 35; Köhler in 'Württbg. med. Correspondenzbl.,' xix, 175.

¹⁶ *Ref.* in 'Med.-chir. Ztg.,' 1847, Nr. 17.

The same epidemic influence came under notice in a very prominent way in those very years in the Northern and Central States of the American Union:¹ the malady became generally prevalent in 1847 (and still more in 1848 and 1849), in the New England States,² New York State,³ Pennsylvania, Maryland,⁴ Indiana and elsewhere. The great extent of this outbreak, the enormous rise in the number of cases when they are compared with the returns for much longer periods before, and the domestication of the disease as an epidemic for a considerable time when it had once begun, are points convincingly proved by the statistics of mortality for the State of Massachusetts and the city of Baltimore. From the papers by Joynes and Frick we find that the average number of deaths from dysentery in a year at Baltimore from 1838 to 1846 was 213, that it rose from 1847 to 1850 to 42, 46, 148, and 137 respectively, and still farther in the next four years to 101, 222, 242, and 252. Assuming an increase of fifty per cent. in the population from 1840 onwards (which is a good deal too much), it will be seen that there was more than twice as much of the sickness (ratio of 213 to 561) from 1847 to 1850, and ten times as much of it (ratio of 21 to 210) from 1850 to 1852. The official report from Massachusetts says: "In each of the six years previous to 1847, the deaths from dysentery averaged 236; in 1847 they rose to 1074, and during the next twenty months (January, 1848, to August, 1849) to 4590, of which 2455 belonged to the eight months of 1849, while during the last eight months of 1848 there were 2135 deaths from dysentery in the State (not including Boston), or 23.53 per cent. of the mortality from all causes. From the 1st of May, 1848, to the 31st of December, 1850, there died of dysentery in a population of one million, 9126 persons. In 1851 the disease was even more general and disastrous; for, while the annual death-

¹ Ref. in 'Transact. of the Amer. Med. Assoc.,' 1848, ii, 150.

² Garrison, *ibid.*, ii, 191 (New Jersey); Wyman, *ibid.*, ii, 197; 'Eighth and Tenth Report to the Legislature of Massachusetts, relating to the Registry and Returns of Births, &c.,' Boston, 1850, 52 (Massachusetts); 'Proceed. of the 63rd Annual Convention of the Connecticut Med. Soc.,' 1855 (Connecticut).

³ Hensbrouck in 'New York Journ. of Med.,' 1853, July, 49.

⁴ Joynes in 'Amer. Journ. of Med. Sc.,' 1850, Oct., 307; Frick, *ibid.*, 1851, Oct., 205; 1855, Oct.

rate from dysentery was 80.2 per 1000 from 1841 to 1850, it rose in 1851 to 91.3 per 1000.¹¹ The epidemic of 1847-49 in Pennsylvania was followed by an equally great rise in the mortality from 1850 to 1853.²

The latest of the wide-spread epidemics of dysentery hitherto was in the years 1853-55. Of that outbreak we have details from some parts of France³ (where the disease covered a large area), from Switzerland,⁴ South Germany (especially Würtemberg⁵), Baden (4064 deaths in 1854⁶), and the Palatinate.⁷ We hear of it also in Denmark,⁸ Sweden⁹ and Russia.¹⁰ In Sweden an increase in the number of cases had been remarked as early as 1852, but only in a few districts; in 1853 the increase was still more noticeable (in Elfsborglän there were 4141 cases officially reported and 760 deaths); but it was in the two years following that the sickness reached its height, overrunning Bohuslän, the northern division of Wermland, and the provinces of Elfsborg, Skaraborg, Halland, Jönköping, Wexiö, Calmar, Blekinge and Oestergötland. The remission came in 1856; and since that time there has been only one considerable epidemic of dysentery in Sweden, in 1882, mostly confined to Malmöhuslän, where there were 3150 cases and 602 deaths (or nearly 20 per cent. of the sick¹¹).

The last point that has to be mentioned in the history of dysentery is, that of recent years over a large part of Europe—I cannot say how it may be in the United States—

¹ Accounts in 'Amer. Journ. of Med. Sc.,' 1841, April, p. 396; 1852, Jan., p. 504; and 'New York Journ. of Med.,' 1852, Nov., p. 382.

² See 'Trans. Pennsylv. State Med. Soc.,' 1852, ii; 1854, iv, 1854; and *Leasure*, *ib.*, vi, 1856.

³ Fouré, 'Histoire de l'épidémie dysentérique, &c.,' Nantes, 1855 (relating to Nantes); Madane de Lalibard, 'La dysenterie à Paris,' Paris, 1858 (severe epidemic).

⁴ Vogt, 'Monographie der Ruhr,' Giessen, 1856 (account of the epidemic in Bern).

⁵ Köstlin, 'Württemb. med. Correspondenzbl.,' 1855, p. 134.

⁶ Ref. in 'Bad. ärztl. Mitth.,' 1855, p. 141.

⁷ Kunst, 'Bayer. ärztl. Intelligenzbl.,' 1856, No. 9.

⁸ Accounts in 'Sundhedskolleg. Aarsberetning,' 1854, p. 37, 1856, 53.

⁹ 'Sundhetskolleg. Berättelse,' 1852, p. 39; 1853, p. 69; 1854, pp. 51-88; 1855, p. 109.

¹⁰ Dreyer, 'Med. Ztg.,' 1854, p. 253 (for Moscow); Koch, *ib.*, 1857 (for Tula).

¹¹ 'Sundhetskolleg. Berättelse,' 1882, p. 16.

the malady has been very much less frequently epidemic than in former centuries, and that in Europe it has almost lost its importance as an endemic disease during the present generation.

§ 86. CONNEXION WITH SEASON AND WEATHER BOTH AS AN ENDEMIC OF THE TROPICS AND AN EPIDEMIC OF THE TEMPERATE ZONE.

After the malarial fevers and yellow fever, there are no diseases so clearly dependent on *climatic influences* for their diffusion over the globe as dysentery and diarrhoea. As endemics they occur to the greatest extent in those parts of the world where the tropical character of the climate is most decidedly marked. In higher latitudes their endemic property becomes less and less conspicuous; so that about the fortieth parallel of north latitude we at length reach a limit beyond which dysentery and diarrhoea hardly occur endemically, but are seen only in sporadic cases or in epidemics. In the latter forms, however, they extend far into the cold zone, and beyond the northern limit of malarial fevers.

The assumption that this kind of diffusion of dysentery and diarrhoea over the globe depends essentially on the influence of climate, is borne out by the connexion that may be traced between the prevalence of the maladies and the *season* or *weather*. In those equatorial regions where dysentery and diarrhoea are endemic, they occur at all seasons: as in India¹ and Lower India (especially Burma²), Cochin China,³ the Malay Archipelago,⁴ the southern coast of China,⁵ the South Sea Islands (Tahiti⁶), New Caledonia,⁷ Mauritius,⁸ the Mozambique⁹ coast and Zanzibar,¹⁰ Madagascar,¹¹ the

¹ The general authorities are Bampffield and Hutchinson; for Bengal and the N.-W. Provinces: Twining, Tytler, Evans, Breton, Dunbar, Forbes, Jackson, Massey, McGregor, Green; for the Presidency of Madras: Annesley, Bidie, Grant, Aubœuf; for the Bombay Presidency: Young, Ewart, Inglis.

² Dawson, Murchison, Beatson.

³ Beauvais.

⁴ 'Arch. de méd. nav.,' 1867, Sept., 168.

⁵ Wilson, Traquair, Armand, Laure, Duburquois.

⁶ Hercouët.

⁷ De Rochas, Charlopin.

⁸ Allan, Power.

⁹ Roquette.

¹⁰ Burton, Semanne.

¹¹ Borchgrevink.

Soudan,¹ Abyssinia,² the coast of Arabia (particularly Aden³), Senegambia,⁴ the West Coast of Africa,⁵ the West Indies,⁶ Mexico,⁷ Central America,⁸ Guiana,⁹ the tropical parts of Brazil¹⁰ and the coast of Ecuador.¹¹ But in these countries they are least frequent in the cold season, becoming more common in the season of heat and drought, and commonest of all towards the end of the rains and beginning of the dry season: that is to say, in those months of the year that correspond to our end of summer and autumn. The same time of the year is the proper season of dysentery also in sub-tropical countries, such as Algiers,¹² Tunis,¹³ Egypt,¹⁴ Persia, Syria, the east coast of China, Japan,¹⁵ southern Australia,¹⁶ the Southern States of the American Union,¹⁷ the southern provinces of Brazil, and Chili.¹⁸ Again, in whatever regions of the temperate or cold-and-temperate zones dysentery occurs at all frequently, it is in summer, especially the end of summer, and in autumn (August to October) that most of the attacks happen. It is in the same season that the epidemics of dysentery are almost always seen; the extremely rare exception of a winter or spring epidemic had either been associated with something special, such as war or famine, or it had been a very small affair.

In St. Louis,¹⁹ Senegambia, according to six years' observations, 9 in every 100 deaths from dysentery happened from April to June, 29 from July to September, 40 from October to December, and 22 from January to March; in Cayenne the percentages for the same quarters were 13·5, 27·0, 35·2 and 24·3; in St. Pierre (Martinique) they were 20·5, 27·7, 33·1 and 18·7. In Algiers, according to Armand (*l. c.*, p.

¹ Peney, Quintin.² Courbon.³ Malcolmson, Steinhauser.⁴ Thevenot, McRitchie, Berville, Béal, Borius, Gauthier, Mondot, Berger, Hebert.⁵ Boyle, Daniell, Trotter, Clarke.⁶ Hillary, Schomburgk, Rollo, Levacher, Mason, Lemprière, Ruz, Dupont.⁷ Poncet, Girard, Heinemann.⁸ Bernhard, Lidell, Buel, Wagner, Bernoulli, Guzman.⁹ Segond.¹⁰ Rendu.¹¹ Duploux.¹² Broussais, Cambay, Catteloup, Haspel, Deleau, Armand, Villette, Froussard, Gaucher.¹³ Ferrini.¹⁴ Pruner, Pugnet, Röser, Griesinger, Pissas.¹⁵ Godet, Scheube, Maget.¹⁶ Richardson, Hall.¹⁷ Rey.¹⁸ Lafargue.¹⁹ Dutroulau 446.

305), two thirds of all the severe epidemics of dysentery have been in summer and one third in autumn. Villette shows that, out of 909 attacks of acute bowel complaint in the Metidja plain (province of Alger), 18 occurred in the first quarter, 21 in the second, 569 in the third and 301 in the fourth; so that the ratios were almost the same as those already stated, or two thirds in summer and one third in autumn. The following gives the monthly distribution of 5959 deaths from dysentery officially reported in Italy from 1881 to 1883:

Deaths from Dysentery in Italy according to Months.

January	239	May	319	September	814
February	162	June	521	October	542
March	190	July	1067	November	383
April	202	August	1219	December	301

The medical reports of Forry and Coolidge give the sick-rate from dysentery and bowel complaint per 1000 men of the United States troops as follows for the years 1819-60:

Cases of Dysentery among the United States Troops.

January to March	119 per 1000.
April to June	217 „
July to September	342 „
October to December	175 „

Among the civil population of the United States, the annual mortality from dysentery, as deduced from the census returns of 1850, 1860 and 1870, was thus distributed over the year:

Deaths from Dysentery in U.S. Civil Population.

Spring ¹ (February to April)	2,556
Summer (May to July)	8,880
Autumn (August to October)	24,084
Winter (November to January)	3,190

In the years 1860 and 1870 the worst quarter was July—September with 10,596 deaths, and the minimum quarter January—March with 1418 deaths; while April—June had

¹ From Woodward, l. c., p. 429. The grouping of the months in seasons is that which is adopted in the census of 1850. In the census of 1860 and of 1870 the number of deaths is given for each month, but it has been put into quarters for the sake of the general average.

3277, and October—December 3032, October alone claiming 1878.

The following table shows the month of outbreak and the season of prevalence of 705 accurately reported epidemics of dysentery in the temperate or temperate-cold zones of both hemispheres :

Table of Epidemics of Dysentery in the Temperate Zone.

Area of observation.	Number of epidemics.	Season of prevalence.						Month of outbreak.											
		Spring.	Spring and summer.	Summer.	Summer and autumn.	Autumn.	Autumn and winter.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
		Spring.	Spring and summer.	Summer.	Summer and autumn.	Autumn.	Autumn and winter.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
United States ¹ ...	59	1	...	21	30	5	...	2	...	1	...	...	4	19	4	3	...	...	1
Italy	10	...	1	4	1	3	1	...	...	...	...	...	1	4	3	...	...	...	...
France.....	96	...	...	33	30	32	1	...	...	...	...	...	2	13	15	18	3	...	...
Switzerland.....	39	2	...	14	17	6	...	...	...	1	1	...	4	8	9	2	...	...	...
Holland and Belgium	29	...	...	8	9	8	...	4	...	...	...	...	...	6	2	1	1	1	1
Great Britain...	45	4	...	11	10	13	2	5	...	...	1	...	...	3	...	6	4	...	...
Germany and Hungary.....	284	4	2	90	143	43	2	...	1	...	2	1	9	72	78	22	5	2	...
Scandinavia and Russia.....	143	2	9	64	44	20	1	3	1	1	...	...	4	10	43	41	9	2	...
	705	13	12	245	284	130	7	14	1	2	2	4	5	30	168	158	59	11	3

According to this table of 705 epidemics, 528 of them have been in summer (or summer and autumn), 137 in autumn (or autumn and winter), 14 in winter, and 25 in spring (or spring and summer). This gives in every fifty epidemics 37·5 in summer, 10 in autumn, 1 in winter, and 1·5 in spring: ratios which nearly agree with those arrived at by Andral, viz. 37 in summer, 10·4 in autumn, 1·2 in winter, and 1·6 in spring. Another noteworthy fact appears from the right hand side of the table, namely, that of 446 epidemics, 415, or about ten in every eleven, had their beginning in the months from June to September.

¹ In this table for the Temperate Zone I include, of course, only those United States epidemics which have occurred in New England, New York, New Jersey, Pennsylvania, and the States of the North-West.

§ 87. SPECIAL INFLUENCE OF HEAT AND OF GREAT DIURNAL
RANGE OF THE THERMOMETER.

From these facts it follows without question that dysentery and diarrhœa stand in a certain causal relationship to *the state of the weather*, and that a somewhat *high temperature* is an essential factor in the etiology. There are many observations that appear to tell in favour of the notion that the extent and severity of endemic and epidemic dysentery increase as the temperature goes up and decrease as it goes down; and that, if the mean temperature be an absolutely low one, such as is observed only outside the tropical or subtropical zones, epidemics will occur only under special circumstances, and will be of slight extent and mild type.

There is one more point to be dwelt upon, which has been indicated already; it is that the worst time of dysentery and diarrhœa in their equatorial and subtropical endemics is, according to most of the authorities, not the time of maximum temperature, but the end of the rains and the beginning of the dry season: that is to say, those periods of the year in which the weather is characterised by extreme fluctuations of the temperature from hot days to cold nights. The same holds good, also, for those regions within the higher latitudes where dysentery, if not quite endemic, is still more or less frequent, the epidemics of dysentery in temperate climates reaching their height generally towards the end of summer or in autumn, or in the time of the year when the particular vicissitudes of weather are usually felt most.

"In the coast districts of Egypt," says Pruner, "dysentery is not very common in proportion to other diseases, but one degree farther south it begins to take a lead, both as regards its frequency and its malignancy of type; while in tropical Africa, in the fork of the Upper Nile and in the low grounds of the White Nile, it attains, along with fevers and smallpox, to almost absolute mastery." Griesinger and other African observers express the same opinion. In Peru, as Archibald Smith and Tschudi are agreed in saying, the extent and severity of dysentery diminish in proportion as

the ground rises from the slopes of the Cordillera, whether on the coast side or in the forest-region of the eastern side, until it reaches the sierras or the puna-region with their temperate climate; while in the deep valleys of the high table-land the disease becomes again as general and as malignant as on the coast or in the forest-region. We meet with the same state of matters in Brazil and in the western mountainous regions of the Argentine Republic; in which countries, as in all other tropical and sub-tropical latitudes, the effect of high temperature on the production of dysentery comes out also in the fact observed many times, that the disease is apt to be exceptionally frequent in years with a very high summer temperature. Thus, from Barbadoes, Hillary writes: "From the observations referred to, which I have been able to make in regard to the changes in the air and the weather upon this island, I have always found that each time dysentery has appeared and become epidemic, the months of May, June, July and August had been very hot and dry." In Jamaica the disease was especially prevalent in 1782, the reason being, as Hunter tells us, the unusual height of the temperature, which rose many times to 90° Fahr. (32° Cent.), while the mean summer temperature of Jamaica is only 25° Cent. (77° Fahr.) There is information to the same effect from the regions within higher latitudes that are liable to a good deal of dysentery: such as the Brazilian provinces of San Paolo and Sta. Catharina, the Southern States of the American Union, Turkey, the south coast of Spain, and Tasmania, where, as Hall explicitly says, dysentery is the more prevalent and more malignant the hotter the summer.

The same influence of high temperature on the production of the malady has been not less pronounced in widespread epidemics, which have coincided remarkably often with hot years. Thus, we are told by the chronicler of the severe sickness of 1540 in England, that the outbreak of the disease was preceded by heat so excessive that the wells and small watercourses were dried up and the cattle were dying for want of water. In like manner the summer of 1583, when dysentery became general in Germany, was remarkable for great heat and drought. Referring to the weather

in the spring and summer of 1624, when the disease was prevalent in the Low Countries and in Germany, Sennert says :

"Ea enim caliditas et siccitas aëris fuit, qualem vix ullus hominum hic meminit, cum post ultimam nivem, quae circa Paschatos festum delapsa est, per menses fere tres subsequentes, exigua immo fere nulla pluvia deciderent, sed perpetuus aestus, qualis saepe vix est in Canicularibus, in hisce regionibus vigeret."

Not to mention the exceedingly frequent local outbreaks of dysentery in exceptionally hot years, we have further evidence of the same kind in the general experience of Lorraine in 1623, of Franconia, Hesse, Thuringia, Saxony and other parts of Germany¹ from 1666 to 1686, of Switzerland and a large part of Northern France in 1750, of Germany, the Netherlands, Switzerland, England and Scandinavia in 1757-59 and 1779-81, of many parts of North America in 1796 and 1797, of Germany, England² and Ireland in 1800, and of France, Switzerland, Germany and Sweden in 1811 and 1834-36. Bergman,³ in summing up his extremely thorough inquiry into the occurrence of dysentery in Sweden, remarks that the disease had rarely attained any considerable epidemic diffusion unless the summer had been remarkable for great heat, and that even the severe epidemics, confined to limited portions of the country, had mostly coincided with extremely hot summer weather. Referring to the epidemic of 1849 in Baltimore, Frick⁴ makes the following remark about the cases in the Maryland Penitentiary, of which none could escape coming under his notice: "Taking the range of the thermometer to be between 78° and 95° Fahr., we have found the cases to increase and decrease almost in proportion to the elevation and depression of the temperature." Gauster's⁵ opinion of the epidemic of 1857 in Carniola is to

¹ Budaeus ('Miscell. med.-chir.,' Lips., 1733, iii, 78) remarks of the weather at the time: "I observed each time that in the May, June and July preceding there had been great heat and drought, with hardly any or no rain and thunderstorms."

² Willan speaks of the summer of 1800 in London as one of the hottest that he had ever experienced ('Reports on the Diseases of London, particularly from 1796 to 1800,' Lond., 1801, Germ. transl., Hamb., 1802, p. 181).

³ L. c., p. 86.

⁴ 'Amer. Journ. of Med. Sc.,' 1851, Oct., 305.

⁵ 'Zeitschr. der Wiener Aerzte,' 1859, p. 558.

the same effect: "It was noticed that the number of cases increased with a rise of the mean temperature of the week; when the thermometer fell considerably the sick-list diminished also. When the mean morning temperature reached 14.3° (57° Fahr.), dysentery began to be epidemic, when it was at 11.7° (53° Fahr.) the new cases ceased, and at 15.4° (60° Fahr.) the admissions were at their height."

We find indirect evidence of the effect of high temperature on the production of dysentery in the fact already mentioned, that a great fall of the thermometer, particularly if it be to the freezing point, has nearly always brought the epidemic to an end. Of the twenty-one winter or winter-and-autumn epidemics in the foregoing table, there were none (apart from those connected with war) at all considerable in their extent; and we are expressly told that the setting in of actual frost made an end of the sickness in most of them. Examples of this are the epidemics of Massachusetts in 1817, Maryland in 1825, Northern France in 1779, canton of Zürich in 1791, the Netherlands in 1783, London in 1669-72, Antwerp in 1831, Meiningen in 1791, the Voigtland in 1798, Baden, Würtemberg and other parts of Germany in 1834, Frederiksborg in 1826 and Livonia in 1846.

As to the influence of an extreme diurnal range of the thermometer (cold nights after very hot days) upon the endemic prevalence of dysentery and diarrhœa in equatorial and subtropical countries, there is almost complete agreement among the observers in those parts of the world. Annesley's¹ Indian experience is thus stated:

"The seasons of an intertropical country, in which a moist state of the air is conjoined with the greatest daily range or sudden vicissitudes of temperature, are those that are generally most conducive to the generation of this disease. When observed as an endemic disease, dysentery generally proceeds from peculiarities of climate, particularly a climate generally characterised by great heat and moisture during the day, with comparatively cold nights and evening fogs and dews."

And a similar opinion is given by nearly all the other authorities for India,² Burmah,³ Cochin China⁴ the Malay

¹ *L. c.*, pp. 396, 406.

² Bampffield, *l. c.*, 69; the authority for Secunderabad in 'Madras Quart-

Archipelago¹ and the southern coast of China.² Heymann makes special reference to two epidemics of dysentery in Samarang and Salatiga (Java), which began during the dry season and came to an end on the arrival of the rainy season: that is to say, the sickness was prevalent during the time of great thermometric fluctuations, which at Samarang amount to 8° or 10° R. (18° or 22° Fahr.) between morning and afternoon, and at Salatiga to even more. During the British campaign in Afghanistan [1841], cases of dysentery and diarrhoea appeared among the troops, as we learn from Hunter and Harthill, whenever the diurnal ranges of temperature began to be noticeable. Corresponding to these statements of the effect of that etiological factor upon the development of dysentery, we find others in the medical writings relating to the coast of Arabia³ (particularly Aden⁴), New Caledonia,⁵ Mauritius,⁶ the Zanzibar⁷ coast, and Nossi-Bé,⁸ Nubia,⁹ Abyssinia,¹⁰ Egypt,¹¹ Algiers,¹² Senegambia,¹³ the West Coast of Africa,¹⁴ the West Indies,¹⁵ Guiana,¹⁶ Brazil,¹⁷ Peru,¹⁸ Central America¹⁹ and Mexico. "In Khartoum," says the traveller Russegger, "fluxes are a common and extremely dangerous form of disease. . . . There is a special risk in the sudden fall of the temperature accompanying the rain-storms that come in the night-time, often without any warning, and bring down the temperature as much as 10 R° (22° Fahr.), or, in the dry season when the north-west wind is blowing, even as much as 20° R. (44° Fahr.). It goes hard then with the man who does not awake soon enough to draw his blanket over him." During

¹ Heymann.² Pearson, Sirr, Laure.³ Aubert-Roche.⁴ Steinhauser.⁵ Charlopin.⁶ Allan, Power.⁷ Semanne.⁸ Guiol.⁹ Russegger.¹⁰ Aubert-Roche.¹¹ Frank, Pruner, Griesinger, Pissas.¹² Villette, Finot, Bertherand, Cambay, Catteloup, Gondineau, Antonini, Froussard.¹³ Thevenot, Brunner, Gauthier, Béal, Thaly.¹⁴ Dutrieux.¹⁵ Hillary, Moseley, McMullin, Levacher, Cornuet.¹⁶ Schöller, Laure.¹⁷ Sigaud.¹⁸ Tschudi, Hamilton.¹⁹ Bernhard, Horner, Lidel.

Med. Journ., 1839, July, 244, 256; 1841, Jan., 12; 1842, 295. Also Murray, Grant, Twining, Morehead, l. c., 524, Mouat, Waring, Massey, Aubouf.

² Waddell.

⁴ Beauflis; also Lenoir, who says that a diurnal range has been observed there from 28°—30° C. (82°—86° Fahr.) to 18°—16° C. (60°—64° Fahr.).

the campaign of Napoleon I in Egypt, Bruant, Barbés and other army surgeons on the French side, as well as Dewar in the English army, had reason to satisfy themselves of the effect of great fluctuations of temperature upon the number of attacks of dysentery: "Les militaires," says Bruant, "qui ont été casernés de bonne heure, se sont peu ressentés de la maladie régnante [dysentery]; elle n'a guère attaqué que ceux qui se sont exposés sans précaution à l'humidité de l'air pendant la nuit." In Algiers the season of dysentery is the time when a very high temperature during the day is followed at sunset by a perceptible chill, a risk that is felt most, as Catteloup tells us, in the province of Oran owing to the configuration of the country; and therein we may find an explanation in part of the fact that dysentery is much more often seen in that province than in Alger and Constantine.

It is perhaps to the same circumstances that we should ascribe the prevalence of dysentery in the eastern "tierra templada" of Mexico, contrasting with its rarity on the western slope of the Cordillera. On the Gulf Coast from November till April, in consequence of the steady north-east trade wind, mists ascend towards the plateau and are there thrown down in the form of copious rains, causing a more or less decided cooling of the air; whereas, on the western declination of the land, the weather is continuously mild, equable and comparatively dry. In like manner the endemic occurrence of dysentery in the town of Basse-Terre, Guadeloupe, is explained by Cornuet; except on the side next the sea, the town is surrounded by hills, whence descend cold winds that cause an evening fall of temperature as sudden as it is severe. McMullin's view of dysentery in Barbadoes is the same: "The disease is always most prevalent where, from the immediate contiguity of mountains, sudden vicissitudes of temperature are experienced." On the Gulf and Pacific coasts of Central America, as well as in Guiana, the differences between the day and night temperature are inconsiderable, even when the range is greatest; they seldom amount to more than 10° or 12° Fahr. But even these slight differences are keenly felt when the day temperature is always high, as we learn from Horner and Lidell. The former of these writes as follows:

"The thermometer averages from 80° to 85° during the day, when the wind is blowing towards the land, but when off of it, as it generally does after 8 o'clock at night, it falls frequently to 76° , sometimes to 74° ; and then from the free perspiration and sensibility of the skin, imparts such a sensation of coldness as to make woollen clothes pleasant."

The climatic conditions here in question are equally insisted upon, as a real etiological factor in dysentery, by Tschetyrkin, Reinhardt and Kaputschinsky for Transcaucasia, by Robertson for Syria, by Lichtenstein, Schwarz and others for the Cape, by Irvine for Sicily, by Rigler for Turkey, and by other authorities for higher latitudes where dysentery, if it be not altogether endemic, is yet met with every year to a greater or less extent. Not less decidedly has the same morbid factor come out in a very large number of epidemics of dysentery that have occurred within the temperate and cold zones, the malady having been prevalent therein mostly, and in fact precisely, at those seasons (end of summer and in autumn) when the weather is to a certain extent characterised by a great diurnal range of the temperature.

The opinions of observers are much divided as to the effect of *atmospheric moisture*, or of *rain and dew*, upon the endemicity and frequency of dysentery and diarrhoea. While some of them are disposed to rate very highly the importance for the pathogenesis of much aqueous vapour in the air, or of copious rains (Annesley, Bampffield and Twining for India, Pruner and Griesinger for Egypt, Schwalbe for Costa Rica); there are others, like Mouat (Bangalore) and Pearson (Canton), who think that it is the dryness of the air which must be regarded as the factor really conducing to the malady; and there are still others, like Sigaud (Brazil) who are of opinion that the extent and severity of an endemic are entirely unaffected either by the dampness of the air or by its dryness, and that bowel-complaints are prevalent as much under the one condition as under the other.

So far as I can decide the question by means of the whole body of evidence as to the time of outbreak and season of prevalence of endemic dysentery and diarrhoea in tropical and subtropical countries, I take the last of these views to be the right one. The dysenteric season in lower

latitudes does not by any means fall in the hot or rainy times of the year, but rather in the period of transition from them to the cold or to the dry season, sometimes even at the end of the dry season and commencement of the rains, the sickness usually disappearing as the rainy season comes to its height. Moreover, there are a good many records of dysentery being epidemic in tropical countries during a time of absolute drought, such as Heymann's narrative before mentioned of three epidemics in Java, all of which happened, as the report says, during the dry months, and came to an end as the rainy season set in. The answer to this question will, in my opinion, be derived less from the endemic experiences of dysentery at places where the conditions of temperature always come in and play the dominant part, than from the epidemiology of dysentery in higher latitudes; and the observations made therein do warrant us in concluding that a damp state of the atmosphere (and of the soil) has very little significance for the development of dysentery, if indeed it have any at all. Of 126 epidemics, for which the state of weather when they began and while they lasted is accurately given, 65 arose with the wet weather or followed it; on the other hand, 61 epidemics made their appearance in the midst of continuous dry weather and lasted through it; and in fact the drought was so great and exceptional in many of these, that it appeared to those who have recorded them to be an especially notable part of the etiology.

The following are examples of *dysentery during unusual drought*: the epidemics of 1540 in England, of 1674 and of 1666 and following years in Germany, and of 1800 in London; also the epidemic at Minden in 1684, of which Hoffmann says that it arose "ob plane insuetam et extraordinariam siccitatem coeli;"¹ the epidemics in France, the Netherlands,² Germany, England and other countries in the years 1779-1781, which were remarkable for the summer heat and drought; and that of Saxony in the year 1800, concerning which Eckner³ says that "the oldest inhabitants could not remember any such extraordinary heat and drought, which seemed to burn up every green thing, threatened

¹ 'Med. rationalis system,' tom. iv, part iii, cap. vii, obs. 6.

² See Gheuns, 'Abhandl. über die epid. Ruhr.' From the Dutch. Düsseldorf, 1790.

³ Eckner, 'Beitr. zur Geschichte der Ruhr,' Gotha, 1801.

the cattle with famine, and dried up the brooks and rivers;" after which he goes on to say: "But now, on the 18th September, there came for a few hours a beneficent storm of rain, which so cooled the atmosphere that everyone felt refreshed. It made so great a difference to the air, moreover, that the dysenteric miasma hovering about in it was as it were deprived of strength, and as if washed away by the rains that followed." There are still other recorded epidemics of dysentery at a time of absolute drought: as at Plymouth¹ in 1782, the arrondissement of Besançon² in 1812, the Canton Vaud³ in 1834, Pennsylvania⁴ in 1850 and 1851, and Ireland⁵ in 1852. Bergman, writing of dysentery as observed in Sweden, says: "How far the quantity of moisture precipitated affects the existence of the malady, remains a question. Several of the more important seasons of dysentery have certainly been ushered in by a very rainy year; but the dysenteric years following them were usually very dry."

In order to arrive at a correct estimate of the significance of weather, and more particularly of temperature, as a factor in the etiology of dysentery, the following considerations should be kept in view:

(1) That dysentery and diarrhoea are comparatively rare, and certainly not endemic, at many points in the tropical and subtropical zones, which differ little or not at all in the matter of climate from other places, many of them in their immediate neighbourhood, which are much subject to those diseases. Instances of this are: Singapore (at the extremity of the peninsula of Malacca), the Andaman Islands and other islands or archipelagoes of the East Indies, the oasis-town of Wargla (Ouaregla, in the province of Oran),⁶ Fort-de-France in Martinique (in contrast to St. Pierre only a few miles off, where dysentery is endemic in its worst form⁷), Grande-Terre in Guadeloupe (where the disease is much rarer than at Basse-Terre, the former being used as a sanatorium for patients with dysentery from the latter), and Monterey on the Pacific coast of Mexico.

(2) That dysentery when epidemic both within the tropics and beyond them, remains exceedingly often limited to cer-

¹ Geach, 'Observ. on the present Epidemic Dysentery,' Lond., 1781.

² Barrey, 'Mém. sur les maladies épidémiques, &c.,' Besançon, 1813, 7.

³ Ref. in 'Schweizer Zeitschr. für Med.,' 1846, 204.

⁴ 'Transact. of the Pennsylv. State Med. Soc.,' 1852, *passim*.

⁵ Malcolm, 'Dubl. Quart. Journ. of Med. Sc.,' 1853, August.

⁶ Creissel, 'Mem. de méd. milit.,' 1873, Juillet, p. 337.

⁷ Charlopin, l. c., p. 20.

tain small circles, to one place, not unfrequently to one section of the place or to one part of the population, especially the military, although the whole country for a great distance round, and in many cases whole tracts of country, are subject to the very same influences of the weather.

(3) That the malady has been known not to occur or at least not to occur in epidemic diffusion, despite the most complete development of those weather conditions which experience shows to be most favorable to epidemic dysentery; more particularly, that great epidemics of dysentery have been much rarer in many parts of Europe during the current century than formerly, although there has been no lack of hot summers, both with and without abundant rains.

(4) Lastly, that not a few epidemics of dysentery have broken out and run their course at a time of mild, steady, and even cool or cold and wet weather, or, in other words, altogether apart from the meteorological influences that have been adverted to.

The following epidemics are examples of the last class: 1817 at several places in Massachusetts,¹ 1854 in and around Cahaba (Alabama²), 1841 in the arrondissement of Metz,³ 1872 in the Canton of Guer (Morbihan⁴), 1831 at Namur,⁵ 1740 and 1743 at Plymouth,⁶ 1769 in County Tyrone,⁷ 1808 in London,⁸ 1687 at Heidelberg,⁹ 1689 and following years at Tübingen (where the summers of 1692 and 1699 were remarkable for their enormous heat and drought, dysentery making no sign, and being but moderately diffused in the very hot summer of 1701¹⁰), 1717 at Schweinfurt,¹¹ 1808 at Erlangen,¹² 1837 at Schwenningen and other places in Würtemberg,¹³ and 1842 at Coblenz (especially on the Hunsrück).¹⁴

¹ Ref. in 'New England Journ. of Med.,' vi, 401.

² Troy, 'Transact. of the Med. Assoc. of Alabama,' 1855.

³ Bastien, 'Trav. de la soc. des sc. méd. du Dpt. de la Moselle,' 1841-3, 9.

⁴ Ledieu, 'Relat. d'une épidémie de dysenterie, &c.,' Paris, 1873.

⁵ Fallot, l. c.

⁶ Huxham, 'Observ. de morbis epidemicis, &c.,' Opp., Lips., 1784, i, 233, 258.]

⁷ Sims, 'Observations on Epidemic Disorders,' Lond., 1773, Germ. ed., Hamb., 1775, 63.

⁸ Bateman, 'Reports on Diseases of London, &c.,' Lond., 1819, 107.

⁹ Brunner, 'Miscell. Acad. Leopold,' Dec., ii, ann. vi, obs. 195.

¹⁰ Camerer, 'Constit. Tübing.,' in Sydenhami Opp., Genev., 1736, ii, 220.

¹¹ Cramer, 'De dysenteria cum petechiis,' Hal., 1718.

¹² Harless, 'Annal. der Heilkunst,' 1811, 1105.

¹³ Rösch, 'Med. Annal.,' v, 422.

¹⁴ 'Bericht des rheinischen Med.-Collegiums für das Jahr 1842,' 42.

Summing up, then, all the facts given and discussed in this section, we are warranted in concluding: (1) That high temperature neither increases by its action on the body the predisposition of the mucosa to become diseased, nor—although this is more probable than the other—does it conduce to the development of the proper morbid cause; (2) that extreme fluctuations of the temperature (in so far as they cause chill) are among the most inviting opportunities for the malady to start; but (3) that it is neither in high temperature nor in an extreme range of the thermometer that we have to look for the proper and real etiological factor of the endemic or epidemic prevalence of dysentery and diarrhœa.

§ 88. OCCURS ON VARIOUS SOILS AND AT VARIOUS ELEVATIONS.

Taking along with the history of bowel-complaint the fact of its endemicity and the limitation of its epidemic diffusion to certain places, often within narrow limits, the suggestion will occur to us that certain conditions of locality, and foremost among them *states of the soil*, are of special importance for the pathogenesis. Inasmuch as dysentery and diarrhœa reveal an unmistakeable analogy with the malarial diseases in their geographical distribution, some have concluded that they are associated no less than these with telluric influences, which, if not a *conditio sine quâ non*, are at any rate a very real condition for the permanent or temporary existence of malaria. But that assumption has not hitherto been borne out by the general body of experience.

No connexion in any way definite can be shown to exist between the frequency or rarity of bowel complaints and the *elevation and configuration* of the ground. They are prevalent both in deep basins and on plateaus, in hilly or mountainous country as well as on low plains, on extensive levels as well as in valleys broad and narrow. The places of highest elevation are not only not exempt but are in fact here and there excessively subject to them, as in the mountainous

districts of India. In many of its epidemics covering wide tracts of country, dysentery has avoided the low and damp localities to seek out the elevated points; or, at all events, there had been no appreciable difference in the number and severity of cases according to the high or low level of the affected spot.

In describing the geographical distribution of dysentery and diarrhœa, I have already pointed out that they occur endemically on the Cordilleras of South America and in the mountainous districts of India. The form of bowel-complaint in these localities is the highly malignant one known under the name of "hill diarrhœa" or "white flux." If it be not the only form of diarrhœa, yet as the former of these names implies, it is the chief variety found to exist endemically along with dysentery in mountainous districts at elevations of 5000 to 10,000 feet: as on the slopes of the Himalaya,¹ the Ghâts,² the table-land of the Deccan,³ Mount Abu⁴ (5000 feet high in the Arawalli range), and in the mountainous parts of the Punjaub.⁵ In Java the flux is met with oftener at elevated places than on the level margin of coast;⁶ thus Heymann has seen a severe epidemic of dysentery at Salatiga (1800 feet high), which enjoys a fresh mountain-climate, whereas Oenarang, situated on the plain at an elevation of only a few hundred feet, escaped the sickness altogether. In Ceylon it occurs as often in the mountain valleys of the interior as on the coast. In Cayenne dysentery is mostly found in the mountainous parts of the country.⁷ In Jamaica, where dysentery is not altogether common as a rule, it is endemic chiefly in the western and

¹ Fayrer, 'Lancet,' 1876, Septbr., 389, and 'Brit. Med. Journ.,' 1884, May, 1031; Ireland, 'Edinb. Med. Journ.,' 1863, Jan., 615 (relating to Simla at 10,000 feet elev.); Farquhar, 'Indian Annals of Med. Sc.,' 1863, April, 457.

² Waller, 'Transact. of the Bombay Med. Soc.,' 1859, new ser., iv, 63 (for Balgam).

³ Mackay, 'Indian Annals of Med. Sc.,' 1856, April, 548 (for Coimbatore); accounts in 'Madras Quart. Journ. of Med.,' 1839, 1841, ll. cc. (for Seringapatam).

⁴ Lowndes, 'Transact. of the Bombay Med. Soc.,' new series, iii, 173.

⁵ Green, 'Indian Annals of Med. Sc.,' 1854, April, 517.

⁶ Ref. in 'Arch. de méd. nav.,' 1867, Septbr., 168.

⁷ Chevalier, 'La Guyane française au point de vue de l'acclimatement, &c.,' Strasb., 1869, 12.

mountainous part of the island.¹ In Martinique it is commonest and most severe at elevations of 500 metres (1600 feet) and upwards.²

In Sweden, says Bergman, the configuration of the country appears to have no important influence on the epidemic outbreaks of dysentery; for the malady is apt to visit the plain of Westergötland as much as the hill districts of Småland and Wermland. On the other hand, elevation above the sea-level appears to be of consequence in this matter, inasmuch as the elevated provinces such as Småland Westergötland, Wermland and Dalarne have been especially often the seat of epidemics of dysentery. During the severe dysenteric sickness of 1779 in France, the disease in the Champagne was strictly confined to the high-lying districts.³ When dysentery was generally prevalent over Germany in 1726, the elevated and mountainous parts of the country, as Hoffmann remarks, suffered to a much greater extent and much more severely than the depressions. In the Würtemberg epidemic of 1838, it was almost exclusively the highest districts that were attacked. We read in the account of the epidemic of 1834 in the Tyrol that "the disease showed itself with equal frequency and malignancy among the mountains of Brixenthal and Niederndorf, on the circumscribed floor of the Hopfgarten valley, and on the broad plain of Ebbs." In the epidemics of 1856 and 1857 in Carniola, according to Gauster's account, the range of the disease extended in part to the plain, in part to the hill country, and in part to the mountains, and its distribution followed the same lines in the epidemic of 1861.⁴

From the Western Hemisphere we have information to the same effect for the great epidemic of dysentery in Maryland⁵ in 1825, for the epidemics of 1842 and 1844 in the Pennsylvanian counties of Lancaster and Chester, where the valleys escaped altogether,⁶ and for those of 1850 and 1881 in various parts of the same State.

¹ Mason, l. c.

² Ruz.

³ Vetillard, 'Hist. des malad. épidém. du Maine,' Paris, 1779, p. 13.

⁴ 'Sanitätsber. vom Herzogthum Krain für 1861 und 1862,' Lallbach, p. 9.

⁵ Draper, 'Amer. Med. Record,' 1827, Oct., 307.

⁶ Agnew, 'Amer. Med. Examiner,' 1852, July.

Altogether irrelevant also for the existence and diffusion of dysentery and diarrhœa, appear to be the *geological formation*, or *kind of rock*, and the *physical character of the soil*. The two diseases have been equally extensive and severe in type on rocky or firm soil and on loose or porous, as well as on all mineralogical varieties of rock belonging to the igneous, volcanic and sedimentary formations.

Nor has the assertion often made, that chalk soil enjoys a special immunity from dysentery, been in any way established. That doctrine was first put forward, so far as I know, by Harris,¹ who based it on observations made in the epidemic of 1797 in Mifflin County, Pennsylvania; according to him, the places situated on the chalk remained quite free from the malady. Boudin² afterwards called attention to the experience of Guadeloupe, where dysentery is much commoner and of a worse type on the volcanic soil of Basse-Terre than on the chalk soil of Grande-Terre; and there are more recent accounts³ from that island to the same effect. Again, in the Luxemburg epidemic of 1863, the disease occurred in districts of clay-slate, sparing those with a chalk soil.⁴ But the conclusion from these facts, of an immunity from dysentery on that kind of formation, has been shown to be untenable by many observations made in the most various parts of the globe, which point in an opposite direction. In India it is precisely on the ferruginous limestone (the so-called laterite⁵ referred to in a former passage as extending from Midnapore⁶ along the northern border of the Deccan) that the worst forms of bowel complaint ("hill diarrhœa") occur. In the account of the Pennsylvanian epidemic of dysentery in 1850, we read with reference to Mifflin County and to the doctrine of Harris above quoted: "The assertion that dysentery never prevails

¹ 'New York Med. Repository,' 1801, iv, 105.

² 'Annal. d'hyg.,' 1846, xxxvi, 97 (following Godineau, 'De l'hyg. des troupes aux Antilles françaises,' Montp., 1844).

³ Carpentin, l. c., 39; Batby-Berquin, l. c., 32.

⁴ Journez, 'Journ. de méd. de Bruxelles,' 1864, Mars.

⁵ See McClelland's account of the laterite in his 'Sketch of the Medical Topography or Climate and Soils of Bengal and the N.-W. Provinces,' London, 1859, p. 120.

⁶ Goodeve, 'India Journ. of Med. Sc.,' 1835, Nov., p. 458.

epidemically upon the limestone is not borne out by our experience here ;" and it is stated with equal emphasis in the reports for East Whiteland, and the Counties of Chester, Berks and Huntingdon (Pa.), that, in so far as the geological formation gave evidence of having any influence at all upon the occurrence and diffusion of the disease, at many places it was only on the chalk that the epidemic existed. It appears also, from the account of the epidemic of 1853 in Pennsylvania, that dysentery had occurred as widely and in as malignant a form upon chalk soil as upon red sandstone, coal, gravel, or other kind of bottom. In an account of the epidemic of 1826 at Roche-Blanche (Puy-de-Dôme), Peyhouse¹ remarks that dysentery is seen nearly every autumn in that village, which is on the chalk, and that the malady almost deserves to be spoken of as endemic there. Referring to the severe epidemic of 1834 in Würtemberg, Hauff² says : " While it will appear to be thus dependent on the season, we may observe that it is altogether independent of conditions of place, that is to say, of the ground on which it occurred ; for, apart from its seasonal modifications already noticed, its career went on in all respects the same whatever the elevation or depth, or the nature of the soil. We see it running the same course on the rough, inhospitable and arid heights of the Alp as in the deep valleys of the Neckar and the Euze, decked out with all the gentle charms of Nature." In its epidemic diffusion there in 1854, the disease showed the same independence of the kind of soil : " It is impossible," says the report,³ " to find anything common to the geology of the various localities at which dysentery appeared. Schramberg stands on primitive rock, the districts of Calwe and Nagold on variegated sandstone, that of Leonberg on muschelkalk, the Welzheimer Wald on keuper, Spaichingen on lias, Neuhausen, Mess-stetten and Hülben on white jurassic rock." In Gauster's report (before mentioned) of the epidemic of 1856 and 1857 in Carniola, it is stated : " The soil in various directions within the epidemic area is either detritus from the limestone of the

¹ 'Journ. gén. de méd.,' xlix, 228.

² 'Zur Lehre von der Ruhr,' Tübingen, 1836, p. 181.

³ 'Württemb. med. Correspondenzbl.,' 1855, No. 34, p. 267.

Styrian Alps, or loam, or a tolerably good humus; here the seat of the malady is near a rapid and cold stream, there it is beside a slower running brook dried up in places, or again it is on a somewhat marshy bottom." With reference to the experience of Sweden on this point Bergman says: "Conditions of soil appear to have hardly any influence, or at most a very slight influence on the occurrence of dysentery, which is found in localities with loamy or argillaceous soil as well as in those with a soil of sand or limestone. This comes out with special clearness in Westergötland, some districts of which, like most of Elfsborglän, have a sandy soil, and others, like the greater part of the so-called Fal-territory, have a loamy soil with chalk or sand, although there are no differences of a definite kind in the distribution of dysentery. A number of observers have indicated a chalk soil as little conducive to the occurrence of dysentery; our experience has been different, inasmuch as the malady has been prevalent on Gottland itself, sometimes even in its most intense form. . . . There are other places, too, such as Rättvik and Silgan in Dalarne, which are well known for the large quantity of chalk in their soil, and have been notorious at the same time as the head-quarters of dysentery."

§ 89. MUCH OF DYSENTERY IS NOT ASSOCIATED WITH MALARIA.

Many observers have laid special stress, in considering the etiology both of endemic and epidemic dysentery, upon the influence of a *damp or marshy soil*; not a few, indeed, have referred the origin of the disease to the same causal factor which underlies the malarial diseases that occur under those circumstances, and have explained *dysentery to be a malarial disease*. This view has found many adherents among Anglo-Indian practitioners. Thus Annesley says (l. c. p. 396): "Of dysentery as well as of fevers it may be confidently stated, that all situations productive of terrestrial emanations or malaria, and which furnish exhalations from the decay of animal or vegetable productions, under the

operation of a moist and hot state of the atmosphere, will always occasion dysentery in the predisposed subject."

The same opinion is expressed by some of the authorities for Cochin China,¹ the West Indies,² Brazil,³ Algiers,⁴ Egypt,⁵ and other countries; and in that sense the observations have been interpreted, which have been made at many parts of the globe, of dysentery becoming epidemic on a wet or swampy soil after inundations or in such like circumstances.

Notable as these observations must always be, the fact of dysentery and diarrhœa occurring endemically along with malarial diseases, or of the two forms becoming epidemic at the same time, does not of itself by any means warrant the conclusion that they are identical in origin. Besides, there is the circumstance pointed out by Morehead in regard to India, that the judgment come to by many observers concerning the endemic occurrences of the two diseases together in tropical and subtropical countries and their origin from a common cause, is based, not upon the experience of particular places in a country, but solely upon a general survey of large tracts of country, the several parts of which show the greatest differences in climatic, geological and nosological respects.

But when we do go into details, we find, in contradiction to these summary generalisations, that the geographical distribution of dysentery and diarrhœa as endemic maladies is a good deal different from that of the malarial diseases. Many places in tropical and subtropical latitudes, which count among the worst centres of malaria on the globe, are little if at all subject to dysentery. In India this holds for the peninsula of Gujerat, which is covered with swamps and abounds in malaria, although dysentery hardly deserves, according to Gibbon, to be called one of its endemic maladies. It applies also, according to Staples, to Puchmurri on the Satpura range; to Ambonia and other East Indian regions of severe malaria;⁶ and to the island of Mayotte in the Comoro group, of which Dutroulau says (l. c. p. 42):

¹ Antoine, Lenoir.

² Lemprière, Rollo, Mason, Hunter, 'Lond. Med. Gaz.', l. c.

³ Sigaud, l. c.

⁴ Haspel, Perier.

⁵ Pruner, Griesinger.

⁶ v. Hattem.

"L'endémie paludéenne absorbe toute la pathologie dans ce climat; elle est hors de proportion avec toutes les autres maladies réunies . . . La dysentérie endémique est à peu près inconnue à Mayotte. Pendant les plus mauvaises années, qui ont été les premières de l'occupation, on n'a observé que quelques cas sporadiques de cette maladie."

Other instances are the very malarious level of Grande-Terre in Guadeloupe, which is found by patients from Basse-Terre suffering from chronic dysentery to be the best place to go to for cure; also some parts of Algiers most abounding in malaria, including Medeah. Again, we meet with centres of severe dysentery at many places within tropical or sub-tropical latitudes which are quite free from malaria or but little subject to it, such as the following in India: Balgâm,¹ (Western Ghâts), Meerut² situated on a dry sandy plain free from marsh, Ferozepore and other places in the mountainous region of the Punjaub,³ and Midnapore⁴ on a dry soil of chalk. Other instances are: the Isthmus of Suez, where, as Courbon says,⁵ malaria is not endemic; Réunion⁶ and Mauritius⁷ on which it is well known that endemic centres of malaria did not exist until 1866⁸ although these islands have been always notorious for bad forms of dysentery and diarrhœa; New Caledonia; Basse-Terre (Guadeloupe), which is a contrast to Grande-Terre in being free from malaria; and Barbadoes, which is one of the least malarious of the Lesser Antilles.⁹

The differences between dysentery and malarial fever in their endemic prevalence come out still more decidedly on comparing in a number of instances the state of health at places not far apart.

"Des localités," says Beauchef,¹⁰ with reference to Cochin China, "où les fièvres intermittentes sont d'une fréquence et d'une gravité extrêmes sont peu visitées par la dysenterie; d'autres réciproquement, où la dysenterie exerce ses ravages, sont exemptes de fièvre."

¹ Morehead, l. c., 258 note.

² Jackson.

³ Green.

⁴ Goodeve.

⁵ L. c., 12.

⁶ Dutroulau, l. c., 71; Gauthier.

⁷ Power.

⁸ See Vol. I, pp. 232, 275.

⁹ In his account of the dysentery of 1780 among the English troops in camp at Castle Fort, Jamaica, Moseley says (l. c., p. 171) that the camp was on an eminence near the shore, five miles to the east of Kingston, where the breeze could strike it, and that there was no standing water or unwholesome emanations near it.

¹⁰ 'Étude sur la dysenterie,' Paris, 1865.

In 1750-1751, M. de Richaumont, Duguay de Déserts and other army surgeons state that the endemicity of dysentery in the French colonies is an etiology almost entirely different from that of the malarial diseases. In Algiers the localizations of dysentery are the province of Oran, one of the least malarious parts of the country; whereas the disease is much more in the malarious provinces of Constantine and particularly so in the province of Alger.¹ In the part of French Tunisian (Tunisi) Coast, which is notorious for its very bad malarial fevers, dysentery is much less common than in Tunis, whose inland is little subject to malariousness or remittence.² In Cayenne dysentery is only moderately prevalent beside the pernicious agues of the country; on the other hand, it is very often seen on the non-malarious islands of Remire and Salut lying off the coast.³

In the epidemics also of dysentery it has been impossible in a very large number of cases to make out that the most development and diffusion are in the smallest degree dependent upon the conditions of soil that are the determining factors of not always yet in the great majority of instances, the development of malarial epidemics. It is very remarkable that the south-west of Germany, where malarial diseases are comparatively rare, has been subject to dysentery much more often and more severely than the north and north-east, where malaria is endemic; and that the great malarious regions of Europe and North America in general, including even those that offer the most favorable conditions for an endemic of dysentery in regard to climate and particularly in regard to heat, are not only not affected more often, but actually in some places less often than elevated and dry localities within the same regions, so much so that they can hardly be said to be true endemic centres of dysentery.

Thus Strack⁴ says of the dysentery of 1757 in Germany: "There are those who believe that dysentery may arise from

¹ Haapel, Catteloup, and others.

² Charlopin, l. c., p. 22.

³ Dutroulau, l. c., p. 71.

⁴ Laure, l. c., p. 50.

⁵ 'Tent. med. de dysenteria,' Mogunt., 1760, p. 19.

the putrid effluvia of marshes in summer; who think, accordingly, that that was the reason of its being more prevalent than elsewhere in the Low Countries such as Gelders, where the soil is peculiarly wet. But if that had been the reason, the disease would have recurred there year after year whenever the heat turned the marsh-water putrid." We have already seen how little the diffusion of dysentery was associated with a marshy or wet soil in the epidemics of 1834, 1838 and 1854 in Würtemberg; or in those of 1856 and 1857 in Carniola, referring to which Gauster says: "Of true malaria there can be no thought for any part of the epidemic area." In Greece, as Stephanos tells us, dysentery is certainly indigenous on wet alluvial soil along the banks of rivers and the shores of lakes; but it is just as common on dry soil; and many marshy districts (in Phthiotis and Bœotia) are but little subject to it. To the same effect there is an exceedingly large body of information from various parts of the globe.

In the excellent work of v. Gheuns¹ on the epidemic of dysentery in the Netherlands in 1783, it is stated: "Dysentery has during this year also been most severe and destructive at places that would seem by their elevated situations to be most exposed to the influence of the weather and injurious properties of the winds. Foremost among them I mention Velau, an elevated tract of country with a dry, sandy bottom, and celebrated for its pure and bracing air, untainted by emanations from low-lying, heavy or swampy ground; but how disastrously during this summer did dysentery rage on that high situation and in that pure air!" After quoting from Vetillard² that the fairest districts of the Champagne, and those accounted most healthy by reason of their elevation, had suffered most from dysentery in 1779, v. Gheuns continues: "In that year also the disease broke out among ourselves, at places where it was impossible to blame a low situation, wetness or swampiness of the ground. . . . If we add to this that both in 1779 and in the present year when so many places in good situations are attacked, there are many other low and wet districts that have remained quite free from our epidemic, although the air in them in consequence of their crowded state must have been, and in fact is, somewhat copiously charged with animal exuvie and other putrid matters, and the more so owing to such heat as we have had, will not everyone be more than ever inclined to infer from this that an elevated, dry and pure situation is

¹ 'Abhandl. über die epidemische Ruhr.' From the Dutch. Düsseldorf, 1790, p. 112.

² 'Histoire méd. des malad. dysentériques du Maine,' Paris, 1779, p. 13.

not only no protection from our sickness but rather a furtherance to it?" In his account of the epidemic of 1797 in and around Harburg, Michaelis¹ draws particular attention to the fact that the malady was prevalent only in the higher districts, on the "Geest," and in quarters of the town at some distance from the Elbe, while the villages on the marsh, as well as the banks of the Elbe generally, and the city of Harburg were exempt. In all the epidemics of dysentery in the Duchy of Nassau from 1812 to 1856, it was the sanitary districts of Rüdelsheim, Eltville, Höchst and Reichelsheim, being the proper malarious centres of the country, that escaped absolutely.² In the Massachusetts epidemics of 1847 and 1848, and the Pennsylvanian epidemics of 1850, 1851 and 1853, the dryness or dampness of the soil in the respective localities did not make the smallest difference either to the number of cases or to the type of the sickness. In Orangeburg and vicinity (South Carolina), the epidemics of dysentery have occurred, as Salley³ observes, equally on dry and sandy hill country, among the pine woods of the plain, and on wet soil.

Face to face with all these facts we shall have to give up believing in the malarial nature of dysentery; we shall have to join with Cordier⁴ when he says to his countrymen who had embraced that theory, such as Haspel and others of African experience: "C'est une erreur des faits, c'est le resultat d'une observation prévenue ou la conséquence d'une vue théorique inexacte et poursuivie avec une obstination malheureuse." At the same time it is not to be denied that wetness of the soil, as influencing the type of weather-conditions, will still be not without significance for the occurrence and diffusion of dysentery, or that malarial disease stands in some sort of causal connexion with dysentery. As regards the former of these points, it has been remarked by Bampffield in his excellent work on dysentery and diarrhoea in India, that a wet soil in the tropics is not in itself a cause of dysentery, but that it can become indirectly an occasion of dysentery in so far as it affects the temperature, and more particularly in so far as it causes a great diurnal range of it.

"Dysentery," he says,⁵ "occurs more frequently in marshy grounds

¹ In 'Hufeland's Journ. der Heilkunde,' 1798, vi, 227.

² v. Franke, 'Nass. med. Jahrb.,' 1859, xv and xvi, 232.

³ 'Charleston Med. Journ.,' 1856, March, xi, 184.

⁴ 'Gaz. méd. de Paris,' 1852, p. 747.

⁵ L. c., p. 68.

and among paddy fields, than in dry and sandy soils. In such situations thick dews generally arise in the night and precipitate in considerable quantities; hence if any Europeans are imprudently exposed to them, it is not difficult to understand in what manner they become the cause of checked perspiration."

And that holds also for the epidemic occurrence of dysentery under the same circumstances in higher latitudes. For example, it is pointed out in the account of the Würtemberg epidemic of 1854, that it was not the more exposed mountain heights or the opener valleys that suffered most from the sickness, but the places at the intermediate elevations and in narrower valleys or troughs where the day and night temperatures stood in sharpest contrast: "Thus we are led to the old idea that sudden and extreme vicissitudes of temperature at the end of summer are pre-eminently favorable to the development of dysentery, and that those states of the ground which are more responsible than anything else for the vicissitudes in question, appear to produce also a disposition towards dysentery among the population." The same view was held by the Baden practitioners for the epidemic there the same year, an epidemic that showed complete agreement with the Würtemberg one in the mode of its diffusion.

In regard to the second point, the link of causation between malarial diseases and dysentery, many observers in the tropics have brought forward the fact that dysentery very often attacks just those persons who are suffering or have suffered from malarial fever. There is also the fact adduced particularly by Anglo-Indian writers (Annesley, Hunter, Gordon), as well as by others for Algiers and for the West Indies (Chisholm, Hunter), that it is a peculiar form of dysentery, marked by the absence of signs of inflammation, and by an insidious, mostly chronic, and very unfavorable course, that is met with for the most part in wet and marshy regions like the low plains of Bengal, the Malabar coast, the marshes of the Metidja plain and the swampy districts of some of the West Indies: a form which is known by the name of malarial dysentery, and contrasts with the dysentery of dry regions (such as northern Hindostan) marked by inflammatory phenomena and acuteness of

type. In my opinion we have here to do, not with a specific form of disease, but with complications: that is to say, with a dysentery that takes a peculiar form in persons under the influence of malaria or who are suffering from the malarial cachexia, and that corresponds, as the course of the disease shows, to the chronic form of dysentery which is principally seen in the natives and the acclimatised. And as malaria has in that way a modifying effect upon the course or type of the disease, in another way it contributes no less to its diffusion, inasmuch as, by affecting the organism, it lessens the power to resist the specific cause of the malady and thereby increases materially the predisposition to a dysenteric attack.

§ 90. THE DYSENTERY OF WAR, FAMINE, AND OTHER OCCASIONS OF MALNUTRITION.

Telling evidence of the effect produced by *things detrimental in the manner of life* upon the occurrence of dysentery and diarrhoea, is furnished most of all by the breaking out of this disease in consequence of general social misery, especially in times of war or in attendance upon famine; and hardly less by its comparatively frequent prevalence within the limits of detached establishments such as prisons and soldiers' barracks. The observations of past centuries, as far back as the war-pestilence of Athens during the Peloponnesian War, are confirmed by the experience of wars within the present century: such as the wars of Napoleon 1790-1815,¹ the Crimean war 1854-55,² the Franco-German war 1870-71, the Russo-Turkish war 1878-79, the English campaigns in New Zealand 1860-61,³—all these in the Eastern Hemisphere; and, in the Western Hemisphere, the French occupation of Mexico, and the Secession war in

¹ See my paper on dysentery in the 'Prager Vierteljahrsschr. für pract. Med.,' 1856, iii, 101.

² See Scrive, 'Relat. méd.-chir. de la campagne d'Orient,' Paris, 1857; Armand, 'Histoire méd.-chirurg. de la guerre de Crimée,' Paris, 1858; 'The Medical and Surgical History of the British Army . . . during the War against Russia,' Lond., 2 vols. (blue-book).

³ Mackinnon, 'Brit. Army Med. Rep.,' 1865, p. 407.

the United States.¹ There has been hardly a single war of long duration, hardly a single siege protracted over several months, in which dysentery and diarrhœa have not broken out in the hostile armies in the field, or among besiegers and the besieged. Among *war pestilences*, alongside of typhus and typhoid, these diseases have always taken a foremost place.

The same diseases have played a not less important part as *famine sickness* in consequence of failure of the crops, as in the following instances: Ireland in 1806, 1817, 1821, 1826, and 1846-47; Belgium, Bohemia, Russia and other countries also in 1846-47; Government of Tobolsk² in 1863; the Galam country of Upper Senegambia in 1852-55, most of the epidemics there, as we learn from the authorities,³ having been associated with famine; Lower Senegambia⁴ in 1864; Algiers and Tunis⁵ in 1868. Smaller outbreaks are those of 1855 in Iceland, where dysentery broke out in consequence of the use of bad food, and disappeared when a better quality was brought in;⁶ and of 1852 in the administrative district of Neuenburg (Württemberg), where there was at any rate dearth of provisions if not actual famine.⁷

In the circumstances last mentioned, it is the use as food of articles that are ill to digest or altogether indigestible, or of decomposed substances, that comes mostly into account. And in the dysentery of war, besides deficient food there are such influences as bad weather, wet clothes, sleeping on wet ground, bad drinking-water, and the fatigues incident to the service, making up an *ensemble* of morbid factors. It is the same integral of causes, under these or similar

¹ See the excellent report by Woodward in the 'Medical and Surgical History of the War of the Rebellion,' pt. ii, vol. i, "Medical History," second issue, Washington, 1879. Among the Federal troops the number of deaths from dysentery and diarrhœa was 37,794, or nearly 30 per cent. of the whole mortality. These diseases were frightfully prevalent among the Federal prisoners who were confined by the Confederates at Andersonville; 50 per cent. of the sickness among them was from diarrhœa and dysentery, and the deaths from those diseases were 58.7 per cent. of the deaths from all causes.

² Fünér, 'Petersb. med. Ztschr.,' 1864, vii, 281.

³ Thaly, 'Arch. de méd. nav.,' 1867, Sept., 176.

⁴ Berger, l. c., 46.

⁵ See also vol. i, pp. 545, 579.

⁶ Konge, 'Sundhedskoll. Aarsberetning for aaret 1856,' 65.

⁷ Kapff, 'Württemb. med. Correspondenzbl.,' 1853, 184.

defects of hygiene, that determines the outbreak of dysentery and diarrhœa in *prisons*,¹ *barracks*,² and institutions of that kind; and on that concurrence also depends the prevalence of the sickness among the *poorer classes of the people*, or among the proletariat as contrasted with the better-off classes, as well as among the *rural population* in contrast to the urban. This relative immunity from dysentery and diarrhœa of the classes in better hygienic circumstances comes out most definitely in the endemic centres of the disease in tropical and subtropical countries, where the incidence is much less frequently upon that part of the population, whether native or foreign, which lives in comfort and leads a healthy life, than upon those classes of the people that exist under the opposite conditions.³ These differences are most strikingly expressed in the comparatively small amount of sickness and mortality from dysentery and diarrhœa among the officers, and the exceedingly numerous admissions and the enormous death-rate among the common soldiers in regiments stationed in those parts of the world. According to the unanimous opinion of authorities in Senegambia, India,⁴ China, Cochin China, Mauritius,⁵ New Caledonia⁶ and other countries, the differences are to be explained really by the detrimental influences to which the latter class of the military are exposed in the manner of life and nutrition of the organism.

¹ Of the very common epidemic prevalence of dysentery and diarrhœa in the prisons of India, we have accounts by Mackay ('Indian Annals of Med. Sc.', 1856, April, p. 548) and Lloyd ('Madras Quart. Journ. of Med. Sc.').

² Epidemics in garrisons are reported by Waring for India ('Ind. Annals of Med. Sc.', 1856, April, p. 471) with special reference to the barracks at Secunderabad; Senelle ('Arch. de méd. nav.', 1857, Jan., p. 62) for Camp Jacob, Guadeloupe; Gestin (ib., 1867, Mai, p. 321) for the barracks of the marines at Brest in 1866, only casual cases having occurred among the civil population; Allaire ('Mém. de méd. milit.', 1861, iii sér., tome v, p. 364) for the cavalry barracks of Thionville in 1857; and by Moty (ib., 1882, Sept. and Oct., p. 460) for the garrison of Bourges in 1881.

³ See the accounts by Rattray ('Edin. Med. Journ.', 1859, Feb., 705) for China; Girard de la Barçerie (l. c., 26) for Cochin China; Lostalot-Bachoué (l. c., 41) for Zanzibar; Charlopin (l. c., 38) for New-Caledonia.

⁴ Waring, l. c.

⁵ Power, l. c.

⁶ Brassac, 'Congrès international des méd. des colonies, &c.', Amsterd., 1884, 313; Cousyn, 'Considér. sur la pathologie . . . en Nouvelle-Calédonie,' Par., 1823, 15.

Lastly, concerning the effect upon the origin of the disease in question of unfavorable hygienic factors in the mode of life and kind of nutrition, we have still to take into consideration the fact that epidemics of dysentery, as we have seen, attain, generally speaking, far greater dimensions in the open country than in towns. This is proved by observations made at many parts of the world: in Western Pennsylvania, according to Callaghan;¹ on European soil, in the great epidemic of dysentery in France in 1779, when the disease was for the most part merely sporadic in the affected quarters of towns (Marmy and Quesnois² point out for the department of the Rhone that it was prevalent among the rural population as contrasted with the urban); in the Netherlands during the epidemics of 1779 and 1783;³ in Ireland, where, according to Wylde's statistics, dysentery occurred mostly in the country districts; in Germany during the epidemic of 1795 in Weimar, of 1798 in the Voigtland, of 1811 in the neighbourhood of Fulda, of 1831 in Galizia, of 1834 around Greifswald and in the Bavarian judiciary district of Kemnath, of 1835-37 and -39 in the department of Frankfurt; and lastly in Sweden, where, according to Bergman, the large towns not unfrequently escaped altogether, even in the worst epidemics, the deaths from dysentery in proportion to the number of inhabitants having been from 1851 to 1865 more than twice as many (2.1 to 1) in the country villages than in the towns.

Nearly all the observers who have given any attention to this matter, or have written upon it, are agreed that one reason of this (not to mention others) is something detrimental in nutrition, to which the country people are more obnoxious than those of the towns, and that the cause should be sought more particularly in the greater exposure of the former to the effects of bad weather.

¹ 'Amer. Journ. of Med. Sc.,' 1838, Nov., 36.

² 'Topog. et statist. méd. du Dpt. de Rhône, &c.,' Lyon, 1866, 120.

³ Gheuns, l. c., 118.

§ 91. INFLUENCE OF IMPURE DRINKING-WATER.

It will not be denied that anything which can excite the intestinal mucous membrane mechanically or chemically can give a direct or indirect impulse to the development of dysentery and diarrhoea. Therefore we cannot doubt that constipation (koprostasis) may give immediate or remote occasion to sporadic cases or to epidemics of those diseases, the retention of fæcal matters being due to the presence of slowly digestible or altogether indigestible matters in the food, to the immoderate eating of certain things, such as fruit, which contains a large amount of vegetable acid, or, lastly, to the abuse of spirituous liquors, one of the most frequent causes, according to English writers, for the outbreak of dysentery and diarrhoea among the British troops in India.¹ But in this connexion a quite peculiar importance must always be assigned to *drinking-water* that is either *rich in insoluble mineral constituents or in soluble salts, sulphates in particular*, or is *contaminated by putrid matters*.²

It is doubtful, to say the least, whether muddy drinking water, or water rich in insoluble inorganic constituents, gives occasion to diarrhoeas by the irritant action of its suspended particles on the intestinal mucous membrane. Chapman, indeed, asserts³ that in places along the Mississippi, people who are not accustomed to the river-water are often attacked by diarrhoea after drinking it; and Hammond⁴ afterwards expressed that opinion not only for the Mississippi, but for other rivers in the Western States, such as the Missouri, the Kansas, and the Rio Grande. But Drake's⁵ information on the circumstances in question in the interior

¹ Thus Nicoll ('Madras Quart. Med. Journ.,' 1841, July, 251): "I have had occasion to treat since my arrival (in Madras) upwards of 2500 cases of idiopathic and symptomatic dysentery, and at this moment I cannot bring to my recollection one instance in which costiveness and drunkenness did not precede the appearance of the dysenteric symptoms."

² An examination of the question will be found in Woodward (l. c., pp. 599—618), from whom I have taken several of the facts mentioned in the sequel.

³ 'Amer. Journ. of Med. Sc.,' 1836, July, p. 68.

⁴ 'Treatise on Hygiene,' Philad., 1863, p. 218.

⁵ 'Treatise, &c.,' Cincinnati, 1850, i, 72.

valley of the Mississippi, as well as Dowler's¹ more especially for New Orleans, is not favorable to that view. In like manner the statement of Parkes² that the drinking of water from the Ganges produces diarrhœa in strangers, is met by the assertion of Stewart Clark³ that water from the Hoogly may be drunk without detriment to health. Moreover, Grellois⁴ has experimented upon himself; for fourteen days he swallowed daily two grammes of earthy sediment from river water without suffering the smallest disturbance of health. Of greater importance, but by no means absolutely trustworthy, are the observations that have been adduced in favour of a disease-producing effect from drinking-water rich in dissolved salts. Pinel⁵ thought that the cause of an epidemic of chronic diarrhœa in the Salpêtrière was to be referred to the use of drinking-water taken from a well on the premises abounding in sulphate of lime and other earthy salts. Parent-Duchatelet⁶ suggested a similar source for the malady when it broke out in the prison of St. Lazare. Green expresses the opinion that the endemic occurrence of severe forms of diarrhœa ("white flux") in the mountainous parts of the Punjaub depends on the use of drinking-water rich in soluble mineral constituents. Annesley,⁷ Twining⁸ and others lay special stress upon the drinking of brackish water. Several French practitioners are agreed in stating that the large amount of dysentery in the province of Oran (Algiers), contrasting with its greater rarity in the province of Alger, depends in part upon the use of water which, almost everywhere in the former province, contains a large amount of salts; according to Marseilhan's⁹ analysis of these waters, they all contain large quantities of sulphate of soda and sulphate of magnesia, as well as carbonate of soda, whereas it is carbonate of lime that occurs in the good drinking-water of Alger.

¹ 'New Orleans Med. and Surg. Journ.,' 861, xviii, 56.

² 'Manual of Pract. Hygiene,' Lond., 1873, 599.

³ 'Pract. Observ. on the Hygiene of the Army in India,' Lond., 1864, 78.

⁴ 'Mém. de méd. milit.,' 1859, ii, 134.

⁵ 'La médecine clinique,' Par., 1815, p. viii.

⁶ 'Hygiène publique,' Par., 1836, i, 236.

⁷ L. c., 403.

⁸ 'Mém. de méd. milit.,' 1842, lii, 117.

⁹ L. c., i, 58, note.

Among the most noteworthy observations of this kind, although always to be taken with reserve, are those which seem to show that the use of drinking-water tainted with putrid vegetable or animal matters, especially faecal, or perhaps charged with the morbid poison itself, is of real consequence in the etiology of diarrhoea and dysentery. Thus Breton¹ tells us that in Ramghar, Sirgooja and other districts of India, the water from the large and rapid rivers with a steep incline can be drunk without harm; whereas water from the small standing pools causes diarrhoea, and thereby furnishes one cause of the dysentery that is endemic there. Gayme and Foucaut² have the same opinion of the water drawn from the rivers in Cochin China, and Lenoir thinks that the drinking-water there is suspected not altogether without reason of causing the disease. Falot³ gives an account of the outbreak of dysentery among the French troops in China after they had drunk the river-water, and he adds that the natives are apt to fall ill in the same way unless they boil the water first. In the report on the health of the British navy for 1866,⁴ there is reference to an outbreak of dysentery among the crew of the *Euryalus* under the same circumstances. Baker thinks that the remarkable frequency of dysentery in Melbourne, as contrasted with its somewhat rare occurrence in other parts of Australia, is in part to be explained by the use of bad drinking-water. Hall observes that epidemic dysentery occurred in Tasmania in 1840 and 1845 at places where stagnant water was drunk; whereas the soldiers and convicts, who were supplied with pure well-water, escaped the disease. Bryson⁵ writes of the West Coast of Africa that water from the Congo has a bad reputation on account of its producing intestinal affections; and McRitchie⁶ says the same of the water from the Gambia (at Bathurst), and at the same time he ascribes, along with other authorities, the greater rarity of dysentery at Sierra Leone of recent years to the fact that the drinking-water is

¹ L. c., 239.

² 'Arch. de méd. nav.,' 1865, Sept., 241.

³ 'Relation méd. d'une campagne en Chine de 1859-62,' Montpell., 1863.

⁴ 'Statist. Report on the Health of the Navy for the year 1862,' 229.

⁵ L. c., 251.

⁶ 'Monthly Journ. of Med.,' 1852, May, 404.

better than it used to be, for the reason that it is now brought in iron pipes from the hills in the neighbourhood, the former contamination of it in the course of transit along the ground being prevented. At Cape Coast Castle Oakes¹ has seen severe diarrhœa in persons who had drunk the water from a tank befouled with soakage of fæcal matters. Gore² has observed the same thing at Bulam (coast of Senegambia). On the Gold Coast also, as Gardiner³ tells us, the use of river-water brings on severe attacks.

At Fort-de-France, Martinique,⁴ there is a prevalent opinion that the use of water from the brook near Saint Pierre produces dysentery.⁵ Davy informs us that the troops stationed at Bruce's Hill, Dominica, suffered from dysentery and severe diarrhœa so long as they took their water-supply from a stream resorted to for washing dirty linen; but after that source of impurity in the water was stopped, the disease lost its endemic character. On Antigua also, according to Davy,⁶ many very severe cases of dysentery and diarrhœa, a certain number of them fatal, have been seen among the troops in consequence of using impure drinking-water. In Surinam, as Hille⁷ tells us, gastric affections, and dysentery in particular, occur as soon as the rain-water stored in the cisterns begins to get exhausted during the protracted drought, and the people are driven to use highly impure river-water, the cases being most numerous among the poorer classes who cannot afford the expense of providing themselves with the cistern-water when it becomes very dear. In Victoria, Vancouver's Island, the number of

¹ Quoted by Parkes, l. c., 41.

² 'Brit. Army Reports for the year 1863,' 428.

³ *Ib.*, 329.

⁴ L. c., 451.

⁵ Dutroulau (l. c.), on the other hand, observes that the soldiers in the garrison of Saint Pierre had been supplied for several years with rain-water for drinking, but notwithstanding, there had been no decline in the frequency of dysentery among them; also that in two French men-of-war at anchor in the roadstead of Martinique, there had been severe outbreaks of dysentery, although during the whole of their stay nothing but distilled water was drunk on board the one, and on board the other water from Fort-de-France; while the merchantmen in the anchorage at the same time escaped the disease altogether although they were supplied with drinking-water from Saint Pierre.

⁶ 'On some of the Important Diseases of the Army,' 1862, p. 69.

⁷ In Casper's 'Wochenschr. f. Heilkde.,' 1843, Nr. 3, S. 43.

cases of diarrhoea and dysentery, which used to be very large, has decreased considerably since the water-supply has been improved.¹ Read² gives the following interesting facts relating to the garrison of Metz in 1870: During the summer there was a severe epidemic of dysentery in two regiments, the rest of the troops escaping it. Inquiry showed that the former had drunk of well-water greatly contaminated with faecal soakage. When the wells were closed the disease suddenly ceased. In 1881 the troops occupying the same barrack had their drinking-water supplied from these very wells; whereupon cases of dysentery re-appeared, and the closing of the wells had once more the desired effect. A fact of the same kind (although the tainting of the well-water was by soakage from a stable) is reported by Raimbaud³ from Sedan in 1776, and another instance is given by Champouillon⁴ in the case of the Caserne Reuilly (Paris), which got its supply of water from the Canal de l'Ourey. Kraft⁵ gives an account of an outbreak of diarrhoea and dysentery at Prague in 1862 after the wells had been flooded with the contents of the sewers and with other impurities in consequence of an inundation of the city. Bergman⁶ gives the observations of a number of Swedish practitioners on the development of epidemics of dysentery from the use of impure drinking-water. Bakke⁷ also thinks that the same noxious influences had contributed materially to the severity of the dysenteric epidemic during the summer and autumn of 1859 in the district of Telemarken, Norway.

Without assigning to these and many other statements like them an absolute and uniform value, I still consider them deserving of every consideration. Even the severest scepticism will be constrained to admit with Virchow:⁸ "Impure drinking-water, tainted with organic matters in

¹ Ref. in 'Arch. de méd. nav.,' 1877, Août, 93.

² 'Mém. de méd. milit.,' 1871, Septbr., 230.

³ 'Journ. de méd. milit.,' 1782, i, 181.

⁴ *Ib.*, 1783, ii, 480.

⁵ 'Prager Viertelj. für Heilkde.,' 1862, iii, 141.

⁶ *L. c.*, 103.

⁷ 'Norsk. Mag. for Lægevidensk 1860,' ii, Raekke xiv, 969.

⁸ 'Arch. für pathol. Anat.,' 1871, lii, 30.

process of decomposition, is justly under suspicion of being able to call forth both typhoid fever and dysentery."

§ 92. NEW COMERS PREDISPOSED.

The *predisposition of individuals* to take dysentery or diarrhœa is equally developed among all races. If there are any considerable differences in the number of cases among the various nationalities represented in a mixed population of a tropical or subtropical region, these are either owing to the unfavorable hygienic conditions spoken of above, which will tell upon the native and the foreign residents of a country equally, or they are due to the influence of a tropical climate upon the immigrants from higher latitudes. The latter is an influence that makes itself felt in two directions. Nearly every European is affected with diarrhœa soon after his arrival in the tropics, although it is only exceptionally, and in consequence of the non-adaptation of the individual to his circumstances, that it assumes a severe type. It is difficult to say how much has to be put to the account of the climate; and how much to something in his mode of life and of nutrition, foreign or ill adapted to the circumstances of the place; at all events the last-named factor plays a not inconsiderable part in the genesis of the disease.

Even in temperate latitudes the observation has often been made, that when dysentery is epidemic at a place it is the new arrivals, particularly the recruits or other fresh troops in the garrison, that are mostly subject to the malady. There are also many experiences to show that, in places where impure drinking-water is used, those most domesticated to the place exhibit a certain tolerance of the noxious principle in it, whereas strangers sicken with diarrhœa after using the water. I have had myself occasion often to observe that fact during a residence of many years at Danzig, at a time when the water-supply was wretched in the extreme.

But, in the tropics, the attack of dysentery or diarrhœa

is of a much more severe type in strangers whose health had suffered from the climate in the course of a prolonged residence. More particularly the disastrous condition of anæmia will have developed itself in them; and that is a condition which, like other debilitating influences, takes away the power of resistance and furnishes one of the most real predisposing causes of attack by the maladies in question.¹ There can be no thought, then, of any immunity from dysentery and diarrhoea gained by acclimatisation in the tropics.

§ 93. CLINICAL AND ANATOMICAL VARIETIES DUE TO DIFFERENT DEGREES OF ONE CAUSE—AN INFECTION.

Dysentery is the clinical expression for an inflammatory affection of the mucous membrane of the great intestine, either acute or chronic in its course, usually non-febrile, and characterised distinctively by more or less frequent and copious evacuations of a thin flux, or of a flux mixed with blood, or of almost pure blood, containing detached epithelium of the intestine and pus or even, in bad cases, fragments of the necrosed mucous membrane, and further characterised by pains in the belly (colic) and straining at stool (tenesmus). The anatomical inquiry shows that one or other of two conditions underlies these symptoms: on the one hand a catarrhal inflammation (in the ordinary meaning of the term), which differs from the simple catarrh of the great intestine in that the inflammatory process extends to the follicles, penetrating therefore to the submucous tissue and inducing a purulent disintegration in the follicles merely (follicular ulcers), or in the general mucous membrane as well (catarrhal dysentery); on the other hand a process depending on

¹ See the writings of Morehead (l. c., p. 525), Cornish and others for India; Gérard de la Barçerie (l. c., p. 33) for Cochin China; Griesinger for Egypt; Férus for the Slave Coast (West Africa); and Ruzs for the West Indies. In this sense the English practitioners speak of a "scorbutic taint" (in other words the ailing look of malnutrition) as a predisposing cause of dysentery in the tropics. There are also accounts by Annesley (l. c., p. 464), Twining (l. c., i., 118) and other Anglo-Indian writers, of "scorbutic dysentery," that is to say, dysentery in persons suffering from scurvy.

diphtheritic involvement, that is to say, deposition of a fibrinous exudation in the tissues of the mucosa, with necrotic destruction of the latter, and formation of ulcers (diphtheritic dysentery). But in the diphtheritic form we also find always more or less extensive tracts of the mucous membrane in a state of simple inflammation or of purulent catarrh.

Definite as is the distinction on the anatomical side between simple intestinal catarrh and catarrhal dysentery, with or without follicular erosion, and between that, again, and diphtheritic dysentery; and equally clear, at least in the majority of cases, as is the characteristic complex of symptoms in each of those diseases during life; yet when looked at from the point of view of their origin, they are far from being etiologically separate units of disease. Experience teaches rather that one and the same noxious influence, provided it be on the whole such as will produce an inflammatory excitation of the mucous membrane of the great intestine, may set up either a simple catarrh, or catarrhal dysentery, or diphtheritic dysentery according to the intensity with which it acts upon the tissue.

To these noxious influences belong, in the first rank, chemical or mechanical excitants, such as vegetable and mineral acids, caustic alkalies, toxic metals (arsenic and the like), substances in process of fermentation or putrefaction, and most of all the accumulation and retention of fæcal matters in the bowel (koprostasis), whether brought about by sluggishness of the gut or by food that is unsuitable by reason of its coarseness, or its difficulty of digestion, or the proportion of its residual matters.

A second and very common occasion for the starting of these diseases is anything that causes chill, including the various meteorological influences already considered, getting wet, and the like.

Each of these harmful things may be a direct cause of the disease by itself, or in combination with others; and that is the explanation of intestinal catarrh, and dysentery occurring sporadically, or, as not unfrequently happens, in groups of cases. But it is very often the case that noxious influences such as improper food, constipation, and chill, act

merely as predisposing causes through the excitation that they induce in the mucous membrane; and in that way they play a prominent part in epidemics and endemics that have something specifically noxious in their causation. As to the *infective nature of the specifically noxious thing*, there is almost complete agreement among observers and investigators; and there can be no question, if I may venture to conclude from the writings of authorities in tropical and temperate latitudes, that the infective process sometimes takes the form of severe intestinal catarrh, sometimes of catarrhal dysentery, and sometimes of diphtheritic dysentery, according to the intensity of the morbid poison or the predisposition of the individual; for all these types occur side by side in endemics as well as in epidemics, leaving no strict lines to be drawn between them, and very often exhibiting transitions from the milder to the more severe forms.

Griesinger, in his sketch of these diseases in Egypt, says: "We take dysentery here to include all the more severe catarrhal processes of the great intestine in their various modifications. We do so, because from the clinical point of view, it would be quite unsafe and impracticable to separate them." And in speaking of the etiology of the disease, he says: "In order to state the etiological problems of Egyptian dysentery at all correctly, we must keep in mind that many, and I am convinced the majority, of the cases of dysentery begin with a simple, and at first slight diarrhoea, and that, if these diarrhoeas are thoroughly well-treated, they seldom come to be true dysentery." To the same effect is the opinion of Pissas for Egypt: "En effet, les lésions anatomopathologiques, c'est-à-dire l'altération de la muqueuse intestinale catarrhale, diphthéritique ou dysentérique proprement dits, non seulement coexistent, mais offrent de l'une à l'autre une transition insensible." There are also statements of a like purport by Ranking, Arthur and others for India, by Richaud, Thil, and Beaufils for Cochin China, by a New Caledonian authority,¹ by Laure, Duburquois, Smart and others for China, by Poncet for Mexico, Smith for Peru, and Ruzf for Martinique. Again, in the accounts of dysenteric epidemics, there is mention often made of the general prevalence of intestinal catarrh at the same time, and of that malady passing into dysentery. Thus it is observed by Kuthe,² in his account of the epidemics of dysentery among the German troops at the camp of exercise near Hagenau (Alsace) in 1874-75-77, and -81, that catarrhs of the great intestine always broke

¹ In "Arch. de méd. nav.," 1866, Janv., 21.

² "Archiv für öffentl. Gesundheitspflege in Elsass-Lothringen."

out in epidemic diffusion at the same time as dysentery proper, that the dysentery was sometimes of the catarrhal type and sometimes of the dysenteric, the former at the beginning and the latter in the subsequent course of the epidemic, "while there were frequent cases of the one passing into the other;" also that the morbid anatomy, in correspondence therewith, showed at the beginning of the epidemic the condition of catarrhal dysentery in the stage of purulent disintegration of the mucosa, and at a later period of the epidemic intense and widespread diphtheritic inflammation. Bergman thus sums up the experience of Swedish practitioners (l. c. p. 72): "Usually diarrhœas are prevalent quite generally at the time of dysenteric epidemics, or antecedently to them; in fact, there is mention made of that circumstance for almost every epidemic of which we have a tolerably full account. . . . The diarrhœas that are prevalent at the time of epidemics of dysentery represent undoubtedly two etiologically different morbid processes: in part they correspond to the catarrhs of the great intestine that ordinarily occur in summer, and may attain an epidemic diffusion under the same weather-influences that favour the outbreak of dysentery, particularly high temperature; in another part the severer forms of these diarrhœas are to be regarded as abortive forms of dysentery having the same relation to the latter that choleraic diarrhœas have to true cholera."

§ 94. THE VIRUS OF DYSENTERY.

Concerning this *morbid poison*—its origin, its nature, its relations to meteorological, terrestrial and other influences—it is impossible for the present to form an opinion. The association of the disease as an endemic with equatorial and subtropical regions, the almost uniform, although not absolute, concurrence of it in epidemics with a high thermometer,—both of these circumstances point to heat as having a preponderant influence in the production of the malady. At the same time it would be a question reserved, whether the individual predisposition to take the disease is merely increased by this etiological factor, or whether it is that the development of the specific morbid poison, including its reproductiveness and potency, is furthered by the heat. It would also remain a question whether wetness of the soil owes, as above indicated, its importance in the production and diffusion of dysentery and diarrhœa merely to the effect that it has on the weather-conditions, or whether a wet soil

rich in organic refuse forms at the same time a peculiarly favorable basis upon which the specific morbid poison may develop. With respect to the latter point, many observers have laid peculiar stress on the presence of putrescent animal matters, particularly faecal matters, in and upon the soil; and they have traced a connexion between that and the prevalence of the disease, as already described, in the poor quarters of towns, in camps and besieged fortresses, in filthily kept and badly ventilated prisons and barracks, or under whatever other insanitary conditions. The importance that is to be assigned among the disease-factors to all such influences has been done full justice to in the foregoing analysis. But in circumstances of that kind, we are dealing always with a complex of noxious influences; and it would be difficult, from the standpoint of our present knowledge, to form a correct estimate of the value of each of them as a separate factor in the etiology.

There remains to be discussed in this connexion one other cardinal question: whether, namely, there is but one dysenteric virus (if the phrase be permitted), whether one and the same morbid cause underlies the endemic dysentery of the tropics and the disease that becomes epidemic in temperate climates, and more especially whether the severe and destructive form of chronic intestinal catarrh that is known in India by the name of "hill diarrhoea" or "white flux," which is designated by the French practitioners as *par excellence* the "diarrhée endémique de Cochinchine," and is also met with endemically in the East Indies and China—whether that form as well owes its origin to the same morbid cause as the dysentery that is endemic in those countries along with it.

According to the descriptions given of this endemic diarrhoea by Grant,¹ Green,² Farquhar,³ Ireland⁴ and Fayrer⁵ for India, by Antoine,⁶

¹ 'Indian Annals of Med. Sc.,' 1853, April, 311.

² *Ib.*, 1854, April, 517.

³ *Ib.*, 1863, April, 457.

⁴ 'Edinb. Med. Journ.,' 1863, Jan., 615.

⁵ 'Lancet,' 1876, Septbr., 389, and 'Brit. Med. Journ.,' 1884, May, 1031. There are also descriptions pointing to the same form of sickness in the writings of Annesley, Twining, Goodeve, and other Anglo-Indians.

⁶ 'Essai sur la diarrhée endémique de Cochinchine,' Par., 1873.

Lenoir¹ and Normand² for Cochin China, and by Smart³ for China, it is an affair of chronic intestinal catarrh which often goes on to follicular erosions of the mucous membrane or even to catarrhal dysentery; but in other cases it ends fatally as a simple catarrhal affection with thinning of the mucous membrane and atrophy of its secretory and absorbent structures, or perhaps with hypertrophy of the mucosa and submucosa, so that the patient finally succumbs to extreme exhaustion and general marasmus.

§ 95. SEARCH FOR PARASITIC ORGANISMS; DOCTRINE OF TRANSMISSION.

However inconclusive may be the answer that we are able to give to all the questions here raised, it is still a very probable conjecture that the proper cause of these infective forms of diarrhœa and dysentery, or at all events of certain definite kinds of them, is organic in its nature; therefore that these maladies range themselves with the class of infective diseases whose *parasitic character* is either proved or at all events made highly probable. And that presumption finds some warrant in the fact that the *communicability of the disease* from place to place and from person to person has been established beyond question by a not inconsiderable number of unbiassed observations.⁴ It need hardly be said

¹ Lenoir, 'De la diarrhée chronique de Cochinchine,' Par., 1874.

² 'Compt. rend.,' 1876, lxxxiii, No. 5, p. 316; and 'Arch. de méd. nav.,' 1877, Jan., p. 35, Févr., p. 102.

³ 'Transact. of the Epidemiol. Soc.,' 1862, i, 218.

⁴ The following are some of the earlier authorities: Sennert, 'Tract. de dysenteria,' 1626, 26; Fr. Hoffmann, 'Med. rat. syst.,' tom. ii, part ii, cap. iii, Opp. Genev., 1740, i, 205; v. Swieten, 'Comment. in Boerhaavii Aphor.,' § 722, Leyd., 1745, ii, 396; Degner, 'Hist. med. de dysenteria bilioso-contagiosa,' Utrecht, 1754, 94; Tissot, 'Avis au peuple sur sa santé,' Lausanne, 1788, 28; Zimmermann, 'Von der Ruhr in dem Volke,' Zürich, 1767, 342. Among the more recent authorities the following pronounce in favour of an undoubted communicability (contagiousness) in dysentery: Franque ('Nass. Jahrb.,' l. c.) for the epidemic of 1846 in the Duchy of Nassau; Kunst ('Bayer. ärztl. Intelligenzbl.,' 1856, 108) for the epidemic of 1854 in the Bavarian Palatinate; the writers on the epidemics of 1861 in Carniola (Sanitätsbericht), and of 1853 and 1854 in Horsens Denmark ('Kongl. Sundhedskollegiums Förhdl.,' 1854, 37, 1856, 53); Ditlevsen ('Hospitals Tidende,' 1883) on the epidemic of 1882 in Lingby (Copenhagen) imported from Malmö; Homan and Hartwig ('Norsk Mag. for Lægevidensk 1860,' ii, R. xiv, 217) and Bakke (ib., 969) for the epidemic of 1859 in Norway; Hullin ('Gaz. méd. de Paris,' 1850, 891) for the epidemic of 1849 in Mortagne (Nor-

that, since the time when the parasitic doctrine of the infective diseases got upon a firmer foundation, there has been no lack of search for some such organic cause of the disease (or specific parasite of dysentery) in the bowel or bowel-discharges of the sick; but no results have as yet been reached that are in the least degree certain.

Hallier¹ was the first, so far as I know, to institute such inquiries. Among the intestinal contents of patients with dysentery, he found the spores of a species of fungus not previously known; but he did not profess to decide whether the fungus was the cause of the disease or a mere concomitant of it. Shortly thereafter Basch² published the results of inquiries that he had made in Mexico, where he had, during the war, many opportunities of opening the bodies of those who had died of dysentery; he stated that he had found mycelial threads and micrococci both in the villi of the small intestine and in the Lieberkühnian crypts of small and large, and in the veins of the submucosa. Next there was published by Lösch³ a case of chronic diarrhoea in which enormous quantities of amœbæ were found in the intestine; experiments to infect dogs (by introducing *per os et anum* the faecal matters containing the amœbæ) had no result. Treille,⁴ who had occasion to see a very mild and limited epidemic on board a French ship-of-war cruising between China and Cochin China, found *Paramœcium coli* (Malmsten) present six times in nine cases, always when there was blood in the dejecta; when the stools were not bloody he never

mandy); Bertrand ('De la dysenterie épidémique, &c.,' Paris, 1873) on the dysentery brought in 1870 from Sedan to Montmedy by fugitive troops; Czernicki ('Mém. de méd. milit.,' 1876, Avril, 125) on the epidemic of 1875 in the camp of Chalons; Moty (ib., 1882, l. c.) on the epidemic of 1881 in Bourges; Rullier, ('Arch. de méd. milit.,' 1884, Nr. 23) on the epidemic of 1884 in Vesoul; Beauchef ('Étude sur la dysenterie, &c.,' Paris, 1865) on the spread of it by contagion in a French ship of war on the coast of Senegambia; Senelle ('Arch. de méd. nav.,' 1867, Janv., 62) on the epidemic of 1866 in Guadeloupe. Also the accounts of Auboeuf (l. c.) for India; of Julien ('Aperçu sur les lésions anatomiques de la dysenterie en Cochinchine,' Montp., 1865) for Cochin China; Gauthier (l. c.) for Senegambia.

¹ 'Zeitschr. für Parasitenkunde,' 1869, I, 71.

² In 'Virchow's Arch.,' 1869, xlv, 204.

³ Ib., 1875, lxx, 196.

⁴ 'Arch. de méd. nav.,' 1875, Août, 129.

found these organisms, nor did he find them in the "severe diarrhœa of Cochin China." He has nothing to say on the connexion between the paramœcium and the dysenteric process. Moty¹ found a variety of monads, vibrios and other low forms of parasites in the dejecta of patients during the epidemic at Bourges in 1881; but he does not believe that any of those organisms can be held to cause the disease. Mackie² has lately put forward the idea, based upon one observation, that a certain kind of dysentery in Egypt is due to the presence of *Distoma hæmatobium* in the intestine. The fact itself is one that Griesinger made out long ago;³ but Mackie has read it amiss, for the reason that the morbid phenomena occasioned by the presence of the parasite are by no means those proper to dysentery. As to the *Anguillula stercoralis*, which Normand found in the intestine and intestinal dejecta of patients with Cochin China diarrhœa, and which he designated as the cause of that malady, the reader will find the particulars in the chapter on Animal Parasites in the second volume of this work, where it is also pointed out that the correctness of the interpretation put upon the discovery by Normand and some other French practitioners appears to be altogether questionable.

Thus we can say but little at present on the nature of the infective matter of dysentery. The facts so far made out concerning the diffusion of the disease help us just as little to speak definitely of the mode of *inoculation* or *transmission* of the *materies morbi*. No doubt it is a very reasonable conjecture that transmission takes place by way of directly introducing the specifically harmful thing into the intestine through the medium of solid or fluid nutritive substances; and the hypothesis is perhaps not to be summarily rejected that the organic excitants in certain forms of dysentery and diarrhœa had originally adhered to vegetable substances and particularly to fruit, that their occurrence in or upon these had depended on certain transitory and seasonal influences of the weather, or on permanent and telluric influences of the place, that the poison obtains entrance into the human

¹ 'Mém. de méd. milit.,' l. c.

² 'Brit. Med. Journ.,' 1882, Oct., 661.

³ See vol. ii, 297.

body when vegetable substances are eaten raw, that it multiplies therein just as it does in the world without, and that it is spread abroad in the dejecta. The notion that in dysentery, as in many other diseases, the drinking-water becomes a vehicle of the infective poison, is supported by a few ambiguous facts, to which attention has been called in an earlier part of the chapter.

The *connexion between dysentery and abscess of the liver* will be discussed fully in the chapter dealing with the latter malady.

CHAPTER XI.

CHOLERA NOSTRAS AND CHOLERA INFANTUM.

§. 96. HISTORICAL REFERENCES TO AND PRESENT CIRCUMSTANCES OF CHOLERA NOSTRAS.

The term "cholera"¹ is used by the earliest medical writers of antiquity to designate two forms of morbid affection of the gastric and intestinal mucous membrane. One of these is *χολέρα ὕγρὰ*, characterised by profuse fluid evacuations, at first tinged with bile but afterwards without colour or resembling the water in which meat has been boiled, and with whitish shreds floating in it;² and further characterised by vomiting and purging, muscular cramps of the extremities, insatiable thirst, suppression of urine and general ebbing of the strength. The other is *χολέρα ξηρὰ* marked by obstinate constipation, abdominal distension, borborygmi and colicky pains.³ The way in which *χολέρα ὕγρὰ* is sketched in several clinical histories given by the Hippocratic writers,⁴ as well as by Aretaeus⁵ and Caelius Aurelianus (i. e. Soranus)⁶ brings it essentially into agreement with the type

¹ The etymology of the word *χολέρα* was a subject of controversy even in ancient times. The fact that the Hippocratic school should have spoken of a *χολέρα ξηρὰ* excludes the idea that the word is derived from *χολή* (bile), or that it had been used in the sense of a bilious flux; and the same fact goes equally against the conjecture of Kraus and Littré that the reference is to *χολέρα*, meaning "a spout." Alexander of Tralles held that it was derived from *χολάδεις* (the intestines), accordingly that it signified bowel complaint.

² Caelius Aurelianus says (l. c.): "Crescente passione aquati atque tenuis oris fit egestio, et aliquando similis loturae carnis. Fernitur etiam cum his moribus plerumque subalbida desputa."

³ Hippocrates, 'De victus ratione in acutis,' Append., § 19, ed. Littré, ii, 488; Galen, 'Comment. in Hippoc. de vict. ratione,' iv, cap. 86, ed. Kühn, xv, 878.

⁴ 'Epidemiorum,' lib. v, §§ 10, 71, 79, ed. c, v. 210, 246, 248.

⁵ 'De causis et signis acut. morb.,' lib. ii, cap. v.

⁶ 'Acut. morbor.,' lib. iii, cap. xix—xxi.

of disease called "cholera" at the present day, or rather "sporadic cholera," so as to distinguish it from the malignant Indian form of sickness which had come to have the same name applied to it from its likeness to the former.¹ But as early as in Galen, cholera as a type of disease begins to lose its distinctive features; he applies the term to various forms of vomiting and purging, clearly intending to include *χολέρα ὕγρη* under his notion of "cholera;" and that generalised use of the word is found also in the later medical writers of antiquity,² in the Arabian³ and Arabistic⁴ writers, as well as in the writings of subsequent centuries.⁵ In fact it is not unusual in modern times for any severe form of vomiting and purging to be designated as "cholera," just as writers have not hesitated to apply the term "influenza" to severe cases of acute catarrh of the respiratory organs.

At all events the medical compendiums and epidemiographical records leave us in no doubt that cholera had existed in every period; and the writings on the diseases of localities show us equally that it has been found in every part of the world, including India, where it exists side by side with "Indian cholera," a disease allied to it closely in the symptoms and perhaps also in the causation.

¹ The term "cholera" is applied to the severe endemic disease of India by as early a writer as Bontius ('*De medicina Indorum*,' Lugd. Batav., 1778, p. 69), in the description given by him of the disease as he saw it in Java.

² Alexander Trallianus, '*Practica*,' lib. vii, cap. 14; Paulus, '*Epitome*,' lib. iii, cap. 39.

³ Rhazes, '*De re medica ad Almansorem*,' lib. ix, cap. 62; '*Divisionum*,' lib. i, cap. 60; '*Continens*,' lib. v, cap. 2, Brix., 1486, fol. q. 2 (a slightly sketched but somewhat characteristic picture of cholera). Also Avicenna, Haly Abbas, and others.

⁴ Gordon, '*Lilium med.*,' Particula V., cap. xiv, Lugd., 1574, 481; Gaddesden, '*Rosa anglicana*,' Aug. Vindel., 1595, 446, 786; Valescus de Tharanta, '*Practica*,' lib. iv, cap. xviii, Lugd., 1490, fol. 72; Guainerio, '*Practica*,' *De fluxibus*, cap. i, Lugd., 1534, fol. 129.

⁵ The connotation of the term cholera is an obscure one even in the often-quoted accounts of the cholera of London in 1669 and following years by Sydenham and Willis. Sydenham ('*Obs. med.*,' sect. iv, cap. 1, 2, ed. Greenhill, p. 164) speaks of "cholera sicca;" and Willis ('*Pharmaceutica rationalis*,' sect. iii, cap. 3, Amstelod., 1682, p. 49) confounds non-hæmorrhagic dysentery with cholera. The vagueness of the term in the sixteenth and seventeenth centuries is further shown by the fact that a question arose whether the "trousseau" of the French, an exquisite form of exanthematic typhus, was not cholera as by the inclusion of various kinds of colic under the same name.

Besides the very large number of references to the occurrence of the malady in temperate latitudes of the Eastern and Western hemispheres, there are not less numerous accounts of it from the arctic zone of Europe and America—from Iceland,¹ Greenland,² and other regions, as well as from tropical countries, such as India, and the Malay Archipelago,³ China, Madagascar,⁴ the African West Coast and Senegambia,⁵ the West Indies,⁶ the Atlantic side of South America⁷ and Peru;⁸ and these references relate to former times as well as to the present.

The disease is found mostly in *sporadic* cases; sometimes also in groups of cases in a particular house or within a small section of the community and limited in their duration, whereby a sort of *epidemic* is created. But cholera nostras is never seen in wide epidemic diffusion, the facts adduced in support of that proposition being based upon errors of diagnosis, particularly the confounding of cholera nostras with ordinary vomiting and purging. All authorities are agreed that cholera hardly ever occurs except in summer and the beginning of autumn, or in the hottest season of the year; and it follows that it is the height of the *temperature* that makes the difference, from the fact that the number of cases will stand in a direct ratio to the level of the thermometer.

Of 440 cases of cholera nostras officially reported during three years (1857-59) in the Duchy of Nassau, 373 were in the quarter July to September, 28 in October, and 39 in the other months of the year.⁹

¹ Hjaltelin, 'Edin. Med. Journ.,' 1862, Septbr., 215.

² Lange, 'Bemaerkninger om Grönlands Sygdomsforhold,' Kjöbenh., 1864, 23.

³ v. Leent, 'Arch. de méd. nav.,' 1867, Septbr., 166; 1868, Septbr., 163.

⁴ Borchgrevink, 'Norsk Mag. for Lagevidensk.,' 1872, iii, R. ii, 238.

⁵ Vauvray, 'Des accidents cholériformes vulgairement appelés "N'Diann" au Sénégal,' Montp., 1866; Borius, 'Arch. de méd. nav.,' 1882, Mai, 372.

⁶ Rufz, 'Arch. de méd. nav.,' 1869, Juin, 431.

⁷ According to Friedel's compilation (from the official Reports) of the state of health in the British navy from 1836 to 1843 ('Die Krankheiten in der Marine,' Berlin, 1866), cases of cholera were most numerous in the ships on the South American and West Indian stations.

⁸ Smith, 'Edin. Med. and Surg. Journ.,' 1840, Oct., p. 369; ref. in 'Arch. d méd. nav.,' 1869, Sept., p. 188.

⁹ v. Franque, 'Nass. med. Jahrb.,' 1863, xix and xx, 137.

So far as the facts are known, there is no reason to conclude that variations in the degree of *atmospheric moisture*, or in the amount of the *rainfall*, have any effect on the number of cases. It is also doubtful whether the much-blamed eating of *sour fruit* has any etiological significance by itself. On the other hand the assumption is not to be summarily dismissed, that the disease originates in a specific infection. In favour of it is the fact that this form of cholera, not less than the Asiatic, bears the mark of an infective malady: that the serious symptoms, such as coldness of the skin, absence of pulse, loss of voice, suppression of urine, muscular cramps, and extreme failure of strength, come on at a period when they are still inexplicable by the quantity of fluids evacuated, and that in other ways they are not in proportion to the profluvium. In favour of it also are a number of observations pointing to some specific morbid poison as the cause of the disease, a poison that had acquired potency among a small and circumscribed group of persons.

One of the most interesting facts of that kind relates to the small epidemic of cholera which occurred in 1829 among the pupils of a school in London.¹ Of 24 boys, from three to fourteen years of age, 21 were attacked almost simultaneously, and of these 2 (aged three and four), died within twenty-four hours; 9 boys who left the school at an earlier hour (day-boarders) remained well. When this alarming incident was inquired into, suspicion fell at first on tainted food or drink; but the investigation on that point, which extended to the utensils for cooking the food as well as to the contents of the stomach and intestine in the fatal cases, brought out nothing to justify the suspicion. The cause of the sudden sickening of so many boys at once was to be looked for, in the opinion of skilled witnesses, most probably in the following circumstances: Three days before the disease broke out, a stinking cesspool behind the school-house, was opened and emptied of its contents, so as to make room in it for a quantity of water that was standing in the playground after heavy rains. The contents of the cesspool were thrown into a garden close by, which was separated from the playground by a low fence of open woodwork. It was made out for certain that only those boys sickened who had been exposed during play to the emanations from that putrescent matter. Another instance is given by Forbes,² where the outbreak of cholera in a number of cases could be traced to the inhalation of sewer gas. There is also an account of a cholera

¹ 'Med. Gaz.,' 1829, Aug., 375, 410; Septbr., 448.

² 'London Med. Examiner,' 1876, i, 47.

outbreak on a large scale in 1863 at Bern,¹ where the infection would appear to have been induced by tainted drinking water.

It remains for the present undetermined whether the process in these and other cases of the same kind is a septic infection or an affair of parasites ; more particularly, whether the fungoid forms found by Finkler and Prior in the dejecta of sporadic cholera, and very like the so-called "comma bacillus," are the specific causes of the sickness.

Cholera Infantum.

§ 97. EARLY ACCOUNTS OF CHOLERA INFANTUM IN THE UNITED STATES ; ITS GENERAL PREVALENCE.

Acute maladies of the intestinal tract take the first place in the statistics of mortality for the age of infancy ; and among these, vomiting and purging carries off most victims in that period of life, under circumstances to be mentioned in the sequel. Cholera infantum, or vomiting and purging in infants, is a comparatively new term in so far as it is taken to denote a form of gastro-intestinal lesion peculiar in its pathology and etiology ; we meet with it first in the medical writings of the end of last century or early years of the present. But there can be no doubt that the malady had occurred at all times under the same circumstances that give rise to it now, and that it has become commoner just in proportion as the etiological factors have made themselves felt in a more intense form and over a wider area.

We can only infer, therefore, as to the past *history of infantile cholera* ; and even within the most recent periods, the information about the disease from various parts of the world is so incomplete and untrustworthy, that we can form no certain opinion of its *geographical distribution*. It may be concluded from the facts, but only with a degree of probability, that the disease occurs all over the globe, and that it is always worst where the causal conditions about to be mentioned are most felt.

¹ Levier, "Schweiz. Zeitschr. für Heilkde.," 1864, iii, 140.

The earliest definite accounts of this serious scourge of infancy come from the *United States*. It is to Benjamin Rush¹ that the credit belongs of having been the first to call the attention of practitioners to the disease; although the names that had been given to it for some time before in colloquial speech, such as "disease of the season," "summer complaint," or "April-and-May disease" (Southern States), stamp it as a malady already known to the people at large. After Rush's paper, there began to come in from all parts of the States accounts by medical practitioners of this disastrous malady, the "*pestis infantum Americana*," the writers vying with each other in their attempts to find suitable language for its destructiveness. "It is the main outlet," says Harrison,² "to the lives of a great many children every year; and when the rest of the community is comparatively healthy, its ravages invade the sanctuary of infantile feebleness and sweep the fond anticipations of parental love to the grave!" From these and innumerable later writings,³ the fact comes out that cholera infantum is everywhere prevalent in the large towns of the North American continent, from Quebec to New Orleans and from the Atlantic to the Pacific; and prevalent to such an extent that Horner⁴ has a certain warrant in speaking of it as "a disease entirely American." In Massachusetts⁵ and Michigan⁶, the deaths from infantile cholera amount to 15 per cent. of the annual mortality from all causes; in the city of Boston the percentage is 22·18. In New York the deaths from that disease between 1805 and 1837 were nearly 2 per 1000 of the population;⁷ and in recent years they have increased considerably. In Philadelphia for the year 1872, the mortality from cholera infantum was reckoned at 2·6 per 1000 of the population,⁸ while

¹ 'Med. Inquiries and Observations,' Philad., 1789, p. 131 (the article on Cholera infantum was written in 1773).

² 'Transylvania Journ. of Med.,' 1828, Feb., p. 100.

³ A very complete list of monographs and articles on Cholera infantum by United States writers is given under that heading in the 'Index Catalogue,' vol. iii, 148.

⁴ 'American Journ. of Med. Sc.,' 1829, Febr., 249.

⁵ Webster, 'Boston Med. and Surg. Journ.,' 1873, Aug., 14.

⁶ Stockton-Hough, 'Philad. Med. Times,' 1873, Decbr.

⁷ Dannel, 'Amer. Journ. of Med. Sc.,' 1838, May, 237.

⁸ Account in 'Transact. of the Pennsylvania State Med. Soc.,' 1873, 193.

from 1819 to 1860 it amounted to between one-fourth and one-third of the deaths from all causes.¹ It is as high, and sometimes even higher, in Baltimore,² Louisville,³ Natchez,⁴ St. Louis (1841-43),⁵ Memphis (which has been called "the graveyard of children")⁶, and in many other large American cities, including even the Californian towns of San Francisco⁷ and Monterey, where as King⁸ says, "more children die of cholera infantum and lobular pneumonia than from any other disease."

There is a lack of information as to the occurrence or frequency of cholera infantum in Mexico, Central America, and South America. At St. Pierre in *Martinique*, we learn from Ruz⁹ that it is, according to the statistics, the chief cause of death in the first years of childhood. But in Barbadoes, as Jackson¹⁰ writes, it is by no means so common as might have been expected from the tropical situation of the island. For Asiatic countries, also, I have found no information as to the malady. For the African continent the only mention of it known to me is a reference to its common occurrence at Port Said.¹¹ Richardson¹² speaks of the heavy mortality that cholera infantum causes in the *Australian* colony of Victoria; and Hall¹³ says that it occurs to a greater or less extent every year at Hobart in Tasmania.

There is but one voice as to the general diffusion of the disease in *European countries*. In the large cities the mortality from cholera infantum can hardly be less than it is

¹ Meigs, 'American Med. Recorder,' 1820, Octbr., 498; Jewell, 'American Journ. of Med. Sc.,' 1860, April, 390, *et seq.*

² Joynes, 'Amer. Journ. of Med. Sc.,' 1850, Oct., 297; Frick, *ib.*, 1855, Oct. 312.

³ Harrison, *l. c.*

⁴ Cartwright, 'Amer. Med. Recorder,' 1826, July, 153, Oct., 225.

⁵ Fourgeaud, 'St. Louis Med. and Surg. Journ.,' 1844, March.

⁶ Grant, 'Amer. Journ. of Med. Sc.,' 1853, July, 108.

⁷ Hexamer, 'Die Kindercholera oder "Summer Complaint" in den Vereinigten Staaten, &c.,' New York, 1858.

⁸ King, 'Amer. Journ. of Med. Sc.,' 1853, April, 390.

⁹ 'Arch. de méd. nav.,' 1869, Juin, 431.

¹⁰ 'Boston Med. and Surg. Journ.,' 1867, July.

¹¹ Vauvray, 'Arch. de méd. nav.,' 1873, Septbr., 161.

¹² 'Edinb. Med. Journ.,' 1869, March, 802.

¹³ 'Transact. of the Epidemiological Society, 1865,' ii, 83.

under the same circumstances in the northern continent of the Western Hemisphere. In Berlin from 1877 to 1882, 17,641 children died of cholera infantum, giving a mean annual death-rate of 2·6 per 1000 of the population.¹ In Hamburg from 1874 to 1884, the rate was 1·9 per 1000 (total of 9004 deaths).² In Stuttgart from 1873 to 1878 it was 2·4 per 1000 (total of 1417 deaths);³ in Königsberg from 1858 to 1862, it was 1·85 per 1000;⁴ while in Nürnberg⁵ it reached the enormous height of 2·9 per 1000 from 1861 to 1863. In Birmingham⁶ from 1873 to 1875 it was 2·04 per 1000. There are accounts also of its great frequency in St. Petersburg,⁷ and other large cities of Russia, as well as at Tiflis,⁸ and in Greece.⁹

§ 98. INFLUENCE OF HEAT.

Without fuller information about the cholera infantum in tropical countries it is impossible to say what influence *climate* may have on the prevalence of the malady, and more particularly whether it be true, as often alleged, that countries both in the cold and hot zones enjoy a comparative immunity from it. But there can be no doubt, after the experience of subtropical and temperate latitudes in regard to the influence of *season* and *weather*, that *high temperature* takes first place among the factors of the disease. The strongest fact in favour of this, as the following table shows, is that the general prevalence of the malady in epidemic form has been always and everywhere in the months of summer, or at the time of greatest heat.

¹ 'Statistische Jahrbücher der Stadt Berlin.'

² 'Bericht des Medicinal-Inspectorats über die med. Statistik des hamburgischen Staates.'

³ 'Die sanitären Verhältnisse u. Anstalten der Haupt- u. Residenzstadt Stuttgart.' Stuttg., 1879.

⁴ Schiefferdecker, 'Königsb. med. Jahrb.', iv, 102.

⁵ 'Health Statistics of Nürnberg' in the 'Bayer. ärztl. Intelligenzbl.'

⁶ Hill, 'Med. Times and Gaz.', 1876, Oct. 496.

⁷ Doepp, 'Abhandl. Petersb. Aerzte,' v, 333.

⁸ Liebau, 'Petersb. med. Zeitschr.', 1866, xi, 281.

⁹ Olympios, 'Bayer. med. Correspondenzbl.', 1840, 184; Pallis, 'Annali univ. di med.', 1842, Aprile; Stephanos, 'La Grèce, &c.', Par., 1884, 543.

Table of Mortality from Cholera Infantum According to Months.

	Period.	Total deaths.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	In other months.
Königsberg	1858—1862	638	17	23	22	26	46	95	97	150	80	36	23	23	
Berlin	1877—1882	17,641	161	135	217	283	713	4418	6226	2889	1612	634	200	153	
Nürnberg	1861—1863	441	11	10	15	16	28	9	52	152	93	28	15	12	
Stuttgart	1853—1862	516	5	7	8	18	18	37	102	170	82	40	18	10	
Massachusetts ¹	1871—1880	2118	2	3	4	8	15	95	720	770	370	95	19	10	
Baltimore, Md.	1850	347	—	—	—	—	—	10	131	122	75	9	—	—	
New York ²	1816—1826	1245								1215					30
" ^a	1837	253								226					27
Rhode Island ⁴	1864	890								855					35
St. Louis, Mo.	1843	488								325					163

In temperate latitudes it is only when the thermometer touches the summer level (17° to 19° C. or 62° to 66° F.) earlier in the season or later, that the maximum of the sickness falls in the spring or is postponed to the autumn months. This is well seen in the southern United States (South Carolina, Georgia, Alabama, Mississippi, Louisiana), where the epidemic begins as early as spring,⁵ the disease being known and dreaded in Charleston as the "April-and-May disorder."

The malady has never become at all general at a lower temperature than 15° C. (58° F.). A comparison of the mean summer temperatures in New York from 1851 to 1857 shows that the epidemic has appeared whenever the mean temperature of the month reached or exceeded 69° Fahr. (20° C.), that it has culminated at a temperature of about 75° Fahr. (24° C.), and has declined at temperatures below 65° Fahr. (17° to 18° C.). A great fall of the temperature always brings the epidemic to an end.

¹ Thirty-Ninth Rep. to the Legislature of Massachusetts, &c., Boston, 1881, 66.

² Niles and Russ, 'Medical Statistics, &c.,' New York, 1827. ³ Dannel, l. c.

⁴ Parsons, 'Transact. of the Amer. Med. Assoc.,' 1865, xv.

⁵ Rush, l. c.; Cartwright, l. c.; Hallowell, 'Amer. Journ. of Med. Sc.,' 1847, July, 40; Heustis, ib., 1839, May, 92.

"A fact," says Potter,¹ "which is familiar to all who are conversant with the disease, further illustrates the agency of heat. A fall of four or five degrees of the thermometer (F.) after a rain, which is usually followed by a western wind (he refers to Baltimore), not only suspends the action of the remote cause, but is salutary to the sick, who, unless in the extremity of illness, revive from a state of prostration; and so long as there is no increase of heat, the number of cases invariably diminishes. Corresponding with these facts, while the number of cases is stationary, or increasing in all June or July, the longer and cooler nights of August curtail the bills of mortality, till the disease is obliterated by the gradual diminution of heat in autumn." In like manner Condie² says of it for Philadelphia: "It invariably terminates with the appearance of cold weather."

All authorities on cholera infantum who have given any attention to the point are agreed that the rate of mortality in each year has been in direct proportion to the mean summer level of the temperature in that year, or that cases of the malady are the more frequent the hotter the summer. Rush's early experience of the disease in Philadelphia had led him to say that "its frequency and danger are always in proportion to the heat of the weather." In the report of the cholera infantum in New York in 1856, we read: "The occasion of this malady is the continued severe heat which we have often to endure during the summer months; the higher the thermometer rises, more particularly the longer the heat lasts without intervals of coolness, the more numerous are the victims of the disease. Our escape from the continuance of hot weather last year (1855) and so far as we have gone in the present year, is unquestionably the chief reason for the notable decrease in the number of cases, last year and this, as compared with 1854 and even with 1853." Jewell says that the comparative rarity of vomiting and purging in Philadelphia in 1859 is to be attributed to the moderate heat of the summer, which was on the average 2° Fahr. lower than in the eight years preceding. In the public health report of 1872 for Philadelphia,³ attention is drawn to the enormous mortality from cholera infantum under the excessive temperature of 80° to 81° Fahr. in July and August, the number of deaths (1666) was double that of

¹ 'Baltimore Med. and Surg. Journ.,' 1833, Oct., p. 110.

² 'Philad. Journ. of Med. and Phys. Sc.,' 1825, new series, i, 16.

³ 'Transact. of the State Med. Soc of Pennsylvania,' 1873, p. 193.

previous years when the heat was less, and two thirds more than in 1870, "thus furnishing renewed evidence for the belief that a high temperature is the sole essential factor in the causation of this most fatal affection." The experience has been the same in many other places. Thus Köstlin¹ points out that at Stuttgart in the hot summer of 1865, 98 children died of cholera, whereas there were only 62 deaths of that kind in the more temperate summer of 1867. In Bavaria, according to Majer,² there were 7958 deaths from cholera infantum in the year 1867-68, while in the year 1868-69, with a lower summer temperature, there were only 5946. Makuna's³ conclusion from the London registrations of this malady from 1876 to 1882, is that it was more frequent and more pernicious the higher the temperature.

As there are still other factors influencing the number of cases, it is not to be expected that the highest temperature of the day or week will always coincide with the largest number of cases or with the highest death-rate; but, within limits, a definite relationship can be made out between the height of the temperature and the amount of the mortality, at least for the most fatal months of the year. The first of the two following Berlin tables for the years 1877-82, shows the ratio of the annual deaths from cholera infantum to the mean summer (May—Sept.) temperature of each year, and the second gives the ratio of deaths in each July (the most fatal month) to the temperature of that month.

Table of Deaths from Cholera Infantum and of Summer Temperatures at Berlin.

Year.	Mean summer temp. R.	Deaths for the year.
1882	16.1	2510
1881	16.2	2684
1877	16.3	2947
1879	16.7	3124
1878	16.8	2886
1880	17.5	3477

¹ 'Württemb. med. Correspondenzbl.,' 1868, No. 43.

² 'Bayer. ärztl. Intelligenzbl., 1871, No. 48.

³ 'Brit. Med. Journ.,' 1883, Sept., p. 579.

Corresponding Table for July only.

Year.	Mean July temp. R.	Deaths in July.
1879	17.2	991
1878	17.4	770
1877	19.3	1207
1882	19.4	829
1880	19.9	1136
1881	20.2	1293

In the first table the deaths keep pace with the increasing heat, except in 1878. In the second table each of the years 1876 and 1882 shows a considerable deviation from the rule; at the same time, if we take 1878 and 1879 together, and compare them with 1880 and 1881, it is clear that the maximum temperature coincides with the maximum death-rate and *vice versâ*. Lastly, there has to be mentioned a fact vouched for by Stephanos, that in Greece the malady is disastrously prevalent on low plains and islands (Syra, Zante, &c.) that have a high summer temperature, whereas it is seldom seen where the temperature is more moderate, as on the coast of Messenia, and on the islands of Chios, Naxos, Cephalonia and Ithaca.

§ 99. OCCURS EQUALLY IN DRY AND DAMP STATES OF THE AIR.

Whether more or less of moisture in the air has any effect on the number of cases, I am unable to decide from the facts before me. Some observers state that dryness of the air is essentially favorable to the starting of the malady; among them Meissner and Makuna, the latter concluding from the London figures for 1876-82 that cholera infantum is more frequent and of worse type the drier the air and the less the rainfall when the temperature is high. Others, such as Cooke of Kentucky, Lindsley of Washington, and more especially Stewart of New York adopt the *converse* opinion, making out a high degree of atmospheric moisture to be of consequence for the number of cases. It will be seen from the following tables, which I have drawn up

the Berlin observations of 1877-82 in order to show the ratio of the atmospheric moisture and of the rainfall to the number of deaths from infantile cholera, that there is no definite relationship to be made out between the two classes of phenomena.

Table of the Dew-Point and of the Deaths from Cholera Infantum at Berlin in June and July 1877-82.

Year.	June dew-point.	June deaths.	Year.	July dew-point.	July deaths.
1877	59	785	1881	63	1293
1878	65	826	1880	64	1136
1879	66	816	1882	66	829
1880	66	950	1877	68	1207
1881	67	508	1878	70	770
1882	67	533	1879	72	991

Corresponding Table for the Rainfall in Millimetres.

Year.	June rainfall.	June deaths.	Year.	July rainfall.	July deaths.
1877	36.5	785	1881	47.3	1293
1879	39.7	816	1877	47.6	1207
1881	55.4	508	1880	65.8	1136
1878	68.6	826	1878	69.7	770
1882	89.3	533	1879	73.9	991
1880	101.1	950	1882	188.0	829

In the first table the number of deaths is seen to be not at all dependent on the degree of vapour in the air. In the second table there appears to be an inverse ratio, for the month of July, between the rainfall and the number of deaths, but in June no such relation comes out; and I am inclined to think, therefore, that no great importance is to be attached to the former result.

§ 100. AN URBAN DISEASE MOSTLY.

Regarding the influence of *locality* on the amount and type of cholera infantum, we have first of all to keep in

mind that the malady, as nearly all observers agree, is much more common in *towns*, especially in large towns, than among the population of country districts or even of the smaller urban communities. Particular interest in this connexion belongs to the fact vouched for by Potter, Cartwright and other United States practitioners, that cholera infantum was seldom prevalent among the first European settlers in America, that it was not until towns were built and a considerable population massed together in them that the malady began to show itself more frequently and at length to assume an endemic character in the large cities, and that therein lies the reason why the disease was first seen on a somewhat extensive scale in the towns on the Atlantic seaboard, and at a later date in the Central and Southern States, following the course of civilisation from east to west. To that fact Parsons¹ adds that the malady becomes more widely spread in suburban localities as well, whenever these become crowded by reason of the great influx of people to the towns.

Further evidence of this kind of unwholesome influence upon the age of childhood produced by residence in large towns, is furnished by the experience of Rush, Müller,² Condie, Grant,³ and other United States practitioners, that the best protection against the malady is to remove children during the hot months from the towns to the country. Rush assures us that he has found that practice to be highly successful.

The effect of a residence in large towns in producing this sickness in children may be unquestionably traced, on the one hand to the fact that the temperature in them is in general higher than in the country, or in small and sparse communities, and more especially that the heat abates less at night; on the other hand, to the unfavorable manner of life in large cities, which proves disastrous, either directly or indirectly, to the tender age of childhood. It is the latter fact that seems to explain the experience of all observers, in the Old World and in the New alike, namely, that

¹ 'Transact. of the Amer. Med. Assoc.,' 1865, xv.

² 'New York Med. Repository,' i, Nr. 1.

³ 'Amer. Journ.,' l. c.

the children of the poor suffer from this disease much oftener and much more severely than among the better-off classes of the people; and that, as Harrison¹ points out for Cincinnati, it is the children of poverty-stricken immigrants, who live in filthy and overcrowded tenements in narrow streets or courts without sunlight and fresh air, that are swept off in large numbers by infantile cholera.

§ 101. SUPPOSED CONNEXION WITH WET SOIL.

Some observers, including Buck and Franklin² among recent writers, have laid special stress on the foundations of houses being damp or soaked with impurities owing to the want of drains or to other cause; as well as on *wetness of soil* in general, and the effect of highness or lowness of the *subsoil water*. Certain of them, indeed, have not hesitated to take cholera infantum to be the outcome of *malarial poisoning*.

I have examined into the relationship between the number of cases and the level of the subsoil water at Berlin from 1877 to 1882, and subjoin the results in tabular form:

Table of Deaths from Cholera Infantum at Berlin during the Summer Months, with the corresponding Subsoil Water-level.

June.	Height of subsoil water. ³	Deaths.	July.	Height of subsoil water. ³	Deaths.	August.	Height of subsoil water. ³	Deaths.
1882	1'60	533	1880	1'47	1136	1880	1'42	448
1880	1'63	950	1882	1'51	829	1877	1'49	469
1881	1'71	508	1878	1'67	770	1881	1'52	480
1878	1'82	826	1877	1'69	1207	1878	1'55	431
1877	1'90	785	1879	1'75	991	1882	1'62	570
1879	1'91	816	1881	1'83	1293	1879	1'65	554

¹ Transact. of the Amer. Med. Assoc., 1849, iii, 619.

² Med. Times and Gaz., 1876, Jan., p. 94.

³ In metres above the zero mill-dam watermark. (The standard is the same in the Table on p. 147.)

It will be seen from this that the height of the subsoil water, so far as concerns the circumstances in a city like Berlin, gives no measure of the rate of mortality. The result is again negative when we compare the death-rate with the range of fluctuation in the ground-water.

Corresponding Table for Fluctuations of the Ground-water.

June.	Variation of subsoil water. ¹	Deaths.	July.	Variation of subsoil water. ¹	Deaths.	August.	Variation of subsoil water. ¹	Deaths.
1882	-0'06	533	1881	+0'12	1293	1882	+0'11	507
1878	-0'15	826	1882	-0'09	829	1880	-0'05	448
1877	-0'19	785	1878	-0'15	770	1879	-0'10	554
1879	-0'19	816	1879	-0'16	991	1878	-0'12	431
1881	-0'43	508	1880	-0'16	1136	1877	-0'20	469
1880	-0'28	950	1877	-0'21	1207	1881	-0'31	480

The notion of the disease being in any way connected with malaria is opposed by the fact of its greater frequency in large cities as compared with the open country, and by its prevalence at a season when malarial diseases are somewhat rare, the deaths from cholera infantum declining very considerably in late autumn when the malarial season is at its height.

"Marsh effluvia," says Potter, "which cover so wide a field in the philosophy of causes, have been enlisted to account for this among a tribe of other diseases, but there are many considerations that lead us to conclude that malaria has no agency in the matter;" and the same opinion is expressed by Cartwright, Hallowell and other United States practitioners.

§ 102. INFLUENCE OF MAL-NUTRITION.

It is unquestionable that *deficient or bad food* has no slight influence on the production of the malady. This follows

¹ The figures show the difference between each month under observation and the preceding month, i.e. between June and May, July and June, August and July, the sign - signifying a fall from the level of the preceding month, and that of + a rise. Thus in June, 1877, the subsoil water stood 0'19 metres lower than in May of that year; again, in July, 1881, it stood 0'12 metres higher than in the June preceding.

from the well-established fact that children brought up at the breast (of the mother or nurse) are much less subject to the sickness than those brought up with the bottle, and still less than those brought up on substitutes for milk. At the same time it is clear that this factor merely provides an opportunity or occasion for the malady to ensue ; unless, indeed, we assume, as is often done, that there is mixed with the food some definite and specific exciting cause of disease drawn from the atmosphere, depending on the insanitary conditions above mentioned, and owing its development more especially to the high temperature. It is in this sense, or something like it, that observers such as Cartwright, Page,¹ Stewart,² Smith³ and Makuna have declared the disease to be of a *miasmatic* or *infective* nature.

§ 103. RACIAL PREFERENCE.

As regards the influence of *racial peculiarities* on the incidence of the disease it is worthy of note that, in Baltimore, Frick⁴ has observed the mortality from cholera infantum to be twice as great among children of the white race as among the coloured.

¹ 'Amer. Med. Recorder,' 1829, Jan., 40.

² 'Essay on Cholera Infantum,' New York, 1856.

³ 'New York Med. Record,' 1878, May, 413, and 'Boston Med. and Surg. Journ.,' 1884, July, 37.

⁴ 'Amer. Journ. of Med. Sc.,' 1855, Oct., 312.

CHAPTER XII.

CONGESTION OF THE LIVER AND TROPICAL ABSCESS.

1. *Tropical Hyperæmia of the Liver.*

§ 104. GENERAL EFFECTS ON THE LIVER OF RESIDENCE IN THE TROPICS.

Acute and chronic hyperæmias of the liver, due to fluxions or congestions issuing in hypertrophy or atrophy of the hepatic tissues, have been met with all over the world wherever the various familar influences are at work, such as the habitual use of stimulating foods or beverages having a specific action on the organ, or those disorders of the circulation, particularly the portal, that are secondary to various acute or chronic states of ill health. But as a properly *endemic* malady, it is in lower latitudes that hyperæmia of the liver occurs. This is the unanimous opinion of authorities in *tropical and subtropical countries*, such as India,¹ the East Indies,² Cochin China,³ Zanzibar,⁴ Madagascar,⁵ Nubia,⁶

¹ See Johnson, 'Influence of Tropical Climates, &c.,' London, 1815, 251; Annesley, 'Researches, &c.,' London, 1841, 180, 199; Twining, 'Clin. Illustr. of the more important Diseases of Bengal, &c.,' Calcutta, 1835, i, 227, 235, 388; Nicoll, 'Transact. of the Calcutta Med. Soc.,' 1827, iii, 245; Parkes, 'Remarks on Dysentery and Hepatitis of India,' London, 1846; Webb, 'Pathol. Indica,' London, 1848, 266*; Maclean, 'Brit. Army Reports for 1862,' 442; Huillet, 'Arch. de méd. nav.,' 1867, Decbr.; Auboeuf, 'Contribution à l'étude de l'hyg. et des malad. dans l'Inde,' Paris, 1881, 54.

² Heymann, 'Krankheiten in den Tropenländern,' Würzb., 1855, 91.

³ Richaud, 'Arch. de méd. nav.,' 1864, Mai-Juin, 350; Beaufrès, ib., 1882, Mai, 364; Saux, 'De l'hépatite des pays chauds,' Paris, 1868.

⁴ Lortalot-Bachoué, 'Zanzibar, Étude sur la constitution phys. et méd. de l'île,' Paris, 1876, 44.

⁵ Borchgrevink, 'Norsk Mag. for Laegevidensk.,' 1872, iii, R. ii, 240; Deblenne, 'Essai de géogr. méd. de l'île Nossi-Bé, &c.,' Paris, 1883, 159.

⁶ Hartmann, 'Naturw.-med. Skizze der Nilländer,' Berlin, 1865.

Egypt,¹ Algiers,² Senegambia,³ the Cape Verde Islands,⁴ the West Indies,⁵ Guiana,⁶ Brazil,⁷ Mexico,⁸ and Central America.⁹ In these countries hyperæmia of the liver is one of the commonest precursors or starting-points of purulent inflammation of the liver; and on that account many observers have included it along with the latter under the common name of "hepatitis."

"After a prolonged residence in this country," says Haspel with reference to Algiers, "it is not unusual to see the liver, *even when the health is good*, acquiring a much greater volume than it would have in France." Pruner says: "In the southern countries of Europe the liver takes on an excessive activity and suffers morbid changes in consequence. But in Egypt that is even more the case, although less so there than in Arabia, Sennaar and, above all, India. In the negroes of tropical Africa, even when the health is tolerably good, the liver is characterised by its weight, bulk, and the remarkable development of granular and fatty substances in its tissues. . . . We see also, in some corpulent persons who are habitually intemperate in eating and drinking, that the liver, so long as it is not more profoundly affected, is subject to periodical swelling under the influence of heat in a way that could hardly be credited, the enlargement being often very obvious for a few days and then subsiding." Heymann, writing from the East

¹ Pruner, 'Die Krankheiten des Orients,' Erlangen, 1846, 308; Sachs, "Ueber die Hepatitis der heissen Länder," u. s. w. ('Arch. für klin. Chir.,' xix), Berlin, 1867, 10; Pissas, 'Congrès des méd. Grecs à Athènes 1882,' Constant., 1883, 18; Friocourt, 'Arch. de méd. nav.,' 1884, Août, 87.

² Haspel, 'Malad. de l'Algérie, &c.,' Paris, 1850, i, 307, 336; Armand, 'Méd. et hyg. des pays chauds, &c.,' Paris, 1859; Rioux, 'Rech. sur les suppurations endémiques du foie,' Paris, 1860; Soyard, 'Considér. sur quelques-unes des affections . . . en Algérie,' Montp., 1868, 22.

³ Gauthier, 'Les endémies au Sénégal,' Paris, 1865, 17; Thaly, 'Arch. de méd. nav.,' 1867, Mai, 363; Verdier, "Contrib. à la géogr. méd.," 'Étude sur le poste de Bakel,' Paris, 1876.

⁴ Hopffer, 'Arch. de méd. nav.,' 1877, Mars, 179.

⁵ Levacher, 'Guide méd. des Antilles, &c.,' Paris, 1840, 198.

⁶ Campet, 'Traité des malad. des pays chauds, &c.,' Paris, 1802, 191; Segond, 'Revue méd.,' 1836, Nov.; Laure, 'Consid. prat sur les maladies de Guyane, &c.,' Paris, 1859, 47.

⁷ Döllinger in 'Casper's Wochenschr. der Heilkde.,' 1835, Nr. 14; Sigaud, 'Du climat et des malad. du Brésil,' Paris, 1844, 336.

⁸ Jourdanet, 'Le Mexique et l'Amérique tropicale,' Paris, 1864, 357; Poucet, 'Mem. de méd. milit.,' 1863, Mars, 228; Wuillot, 'Presse méd. belge,' 1866, Nr. 40; Lucas, 'La frégate à hélice la Victoire à Guaymas et à Mazatlan,' Paris, 1868, 39.

⁹ Bernoulli, 'Schweiz. med. Zeitschr.,' 1864, iii, 100; Guzman, 'Essai de topogr. phys. et méd. de la république du Salvador,' Paris, 1869, 102.

Indies, says: "There is a hypertrophy of the liver due to the climate, which shows itself in the first year after arrival in the tropics; and there are few Europeans that escape it. The hypertrophy progresses to a great extent without attracting any attention during life. But if death should ensue from some other malady, the liver will be found in most cases enlarged by about one-fifth of its volume, the increase being almost entirely in the right lobe, which has become more vascular and more friable than the left. When that hypertrophy has reached a certain limit it usually remains stationary, so that it may be regarded as a completed episode. In those who go back to Europe after a time, it would seem that it undergoes retrogression."

§ 105. THE EFFECTS DUE IN PART TO MALARIAL INFLUENCES
AND IN PART TO HEAT ALONE.

This endemicity of hyperæmia of the liver in tropical or subtropical countries, with or without consecutive hypertrophy of the organ, is to be explained, in contrast to its merely sporadic occurrence in higher latitudes, partly by the fact that the same influences which occasionally give rise to it in the latter are at work to a greater extent in the former; in part also by the other fact that there are influences felt in lower latitudes which are entirely absent from the temperate zone. In the former class we have to lay most stress upon *malaria*; in the latter, upon the effect of continued *high temperature*.

Acute enlargement of the liver in the course of malarial fever is as rare in higher latitudes as it is a common incident of the malarial fevers of the tropics. Again, while chronic hyperæmias and hypertrophies of the liver as the sequelæ of protracted malarial fever are but exceptional in the former, and for the most part merely the outcome of a deeply rooted malarial cachexia; in tropical countries, on the other hand, they take a foremost place, along with endemic disease of the spleen, among the organic lesions caused by malaria. That holds good for the indigenous inhabitants of the tropics, but not to the same extent as for the foreign residents, who are subject to the malarial influences more often and more seriously than the natives.

But among the foreign residents, tropical climate, and especially tropical heat, play a much greater part in produc-

ing hyperæmia of the liver. If we are still unable to solve the question how it is that continuous high temperature has the effect of increasing the physiological activity of the liver, or of inducing a hyperæmic condition of the organ;¹ if we ought to take into account, besides temperature, perhaps other characteristics of a tropical climate such as atmospheric moisture; still there can be no doubt about the influence of heat itself, seeing it as we do in the non-acclimatised acting so as to produce certain phenomena that point solely to hyperæmia of the liver, such as a feeling of weight in the hypochondrium, and enlargement of the organ discoverable by percussion. In other sections of this chapter I shall consider how far errors of nutrition, in one degree or another, practised by residents of the tropics may contribute to develop these hyperæmic conditions of the liver and such lesions of the organ as ensue from them.

2. *Tropical Abscess of the Liver.*

§ 106. GEOGRAPHICAL DISTRIBUTION OF TROPICAL ABSCESS.

Abscess of the liver in countries of the temperate and cold zones counts among the rarest of diseases. In lower latitudes it is just as frequent as in higher latitudes it is rare; and it is commonest of all in equatorial regions. It has very decidedly, therefore, the character of a *tropical disease*; its frequency depends, if it do not absolutely depend, upon the degree of tropical climate corresponding to the geographical position of the various points within its area of distribution; and accordingly it finds its limit as an *endemic malady* in the sort of climate that characterises the southern peninsulas of Europe.

Among the countries most subject to abscess of the liver,

¹ The commonly received explanation of the phenomenon is that the action of the lungs is reduced in the tropics by reason of their diminished expansion, while that of the liver is raised so as to equalise the process of oxidation, and more particularly to get rid of the carbonic acid. This explanation has lately been adopted by Sachs.

India and the other tropical regions of Asia take first place;¹ so that Bontius could with justice say: "Nullum viscus, præter intestina, frequentius in his regionibus infestatur, quam jecur,"—a remark that applies not merely to suppurative hepatitis but to liver-diseases in general. The frequency of the disease in India cannot be stated accurately in figures, for the reason that all the statistical returns from that country relate almost exclusively to British troops, and also because most of them give the various hepatic diseases under one head, or at best give their information as to the number of the cases in question under the comprehensive title of "hepatitis." Still we may get from them an approximate measure of the frequency of abscess of the liver in the whole of India, and in the several divisions of the country. According to Fayrer (l. c.) the proportion of deaths from abscess of the liver among the British troops

¹ The following is an alphabetical list of authorities for India: Annesley, l. c.; Arthur, 'Indian Annals of Med. Sc.,' 1856, April, 630; Auboeuf, l. c.; Balfour, 'Edinb. Med. and Surg. Journ.,' 1847, July, 33; Birch, 'Madras Quart. Med. Journ.,' 1839, i, 320; Bontius, 'De medicina Indorum,' Lugd., Batav., 1718, 71; Chevers, 'Ind. Annals of Med. Sc.,' 1858, July, 658; Conwell, 'Treat. on the Functional and Structural Changes of the Liver, &c.,' Lond., 1835; Cornish, 'Report of the Sanitary Commissioner of Madras,' 1869, 8; Curtis, 'Acc. of the Diseases of India, &c.,' Edinb., 1807, 29; Day, 'Madras Quart. Med. Journ.,' 1861, April, 321, Oct., 247; Eyre, ib., 1860, Oct., 339; Fayrer, 'Lancet,' 1880, May, 673, 1881, May, 803, 1884, June, 1130; Geddes, 'Transact. of the Calcutta Med. Soc.,' vi, 284, and 'Clinical Illustr. of the Diseases of India,' Lond., 1846, 143; Gordon, 'Med. Times and Gaz.,' 1856, Novbr.; Henderson, 'Madras Quart. Med. Journ.,' 1840, iii, 317; Huillet, l. c.; Hunter, 'Transact. of the Bombay Med. Soc.,' 1840, ii, 26; Jackson, 'Transact. of the Calcutta Med. Soc.,' i, 295; Johnson, l. c.; Kinnis, 'Edinb. Med. and Surg. Journ.,' 1851, July 25th, 283; Mackay, 'Ind. Annals of Med. Sc.,' 1856, April, 550; Maclean, l. c.; Macpherson, ib., 1858, Jan., 244; Martin, 'Quarterly Journ. of the Calcutta Med. Soc.,' i, 655; McGregor, 'Observ. on the Principal Diseases in the North-West Provinces of India,' Calcutta, 1843, 111; Milward, 'Brit. Med. Journ.,' 1884, June, 1086; Morehead, 'Clinical Researches on Disease in India,' Lond., 1856, ii, 1; Moust, 'Transact. of the Calcutta Med. Soc.,' vi, 24, and 'Madras Quart. Med. Journ.,' 1839, ii, 8; Murray, ib., i, 77, 165; Nicoll, l. c.; Parkes, l. c.; Ranking, 'Madras Quart. Journ. of Med. Sc.,' 1863, July, 46; Saunders, 'Observations on the Hepatitis of India, &c.,' Lond., 1809; Stovell, 'Transact. of the Med. Soc. of Bombay,' 1857, new ser., iii, 38; Tait, 'Edinb. Monthly Journ.,' 1852, April, 289; Twining, l. c.; Waring, 'Inquiry into the Statistics and Pathology of some Points connected with Abscess of the Liver, as met with in the East Indies,' Travancore, 1854, and 'Ind. Annals of Med. Sc.,' 1857, April, 476; Webb, 'Pathologia indica,' Lond., 1848, 255.

from 1850 to 1879, in a mean strength of 57,742 men, was 12·67: that is to say, 2·19 per 1000 died of that disease every year; the ratio in the Madras army being 3·31, in the Bengal army 2·04, and in the Bombay army 1·71 per 1000. The following are Chevers's figures of the cases of "hepatitis" among British troops:

Presidency.	Years observed.	Per 100 of all admissions.
Bengal . . .	43	2·9
Bombay . . .	51	3·8
Madras . . .	12	6·3

From both series of observations, as well as from the facts recorded by many other authorities,¹ it follows that the disease is most frequent in the Madras Presidency, being very much rarer in the Presidencies of Bengal and Bombay. In Madras, it is oftenest met with on the Coromandel Coast and on the slopes of the Eastern Ghâts, although even very elevated places are not exempt from hepatitis; in certain years the number of cases among the troops has been as high as 11·10 per cent at Bangalore and 14·54 per cent. at Secunderabad; it is said to be less common in the district of Cochin (southern part of the west coast).² Next to Madras, certain regions belonging to the Bombay Presidency appear to be the most subject to inflammation of the liver. Morehead estimates the annual number of cases of hepatitis among the British troops at 7·4 per cent. of the total strength, an estimate that nearly agrees with the figures for 1847-50 by Kinnis, who gives 1490 cases among 20,350 men. In the Bombay Presidency, as in Madras, it is on the slope of the Ghâts, as Hunter tells us, that the malady is most common. In Bengal it is somewhat less common; according to Macpherson's figures from 1812 to 1853, the annual number of cases among the British troops was only 6 per cent. of the total strength, and in the last eight years of the period 5·7 per cent. McGregor says that it is especially common in some parts of the North-West Provinces.

¹ Johnson, Curtis, Nicoll, Mouat, Cornish.

² Day.

These data, it should be clearly understood, apply only to the British troops in India. Among the sepoy, as well as among the civil population both native and foreign, inflammations of the liver are much less common, as Waring, Mackay, and others point out, although even in those classes they are seen in considerable numbers.

According to Morehead the number of cases of hepatitis on an average of six years admitted into the European Civil Hospital of Bombay was 3·7 per cent. of the total admissions, and into the Native Hospital 1·5 per cent.; the mortality in the former from abscess of the liver was 7·8 per cent. of the deaths from all causes, and in the latter 3 per cent.

In *Ceylon*¹ hepatitis is seen among the British troops almost as commonly as in Bengal, the yearly admissions being 5·5 per cent. of the total strength. Also from certain parts of *Further India*, such as Burmah and the peninsula of Malacca, we have accounts² of the frequent occurrence of the disease. It is rarer in *Cochin China*, according to the unanimous statements of French authorities;³ and the same holds for the *Chinese ports*⁴ and for the southernmost and subtropical parts of Japan (districts of Kommamoto in Sikokf, and in Kiusiu and Nagasaki),⁵ while in the northern

¹ Marshall, 'Notes on the Medical Topogr. of the Interior of Ceylon,' London, 1821 (specially trustworthy because based on post-mortem examinations); Tulloch, 'Statist. Reports,' Lond., 1841.

² Murchison, 'Edinb. Med. and Surg. Journ.,' 1855, April, 247; Stewart, 'Indian Annals of Med. Sc.,' 1854, April, 432; Ward and Grant, 'Official Papers, &c.,' Pinang, 1830.

³ See Foiret, 'Causes et lésions de l'hépatite suppurative,' Paris, 1860; Richaud 'Arch. de méd. nav.,' 1864, Mai—Juin, 350; Ollivier, 'Observ. faites en Algérie, Chine et Cochinchine, &c.,' Strasb., 1864, 87; Laure, 'Hist. de la marine française pendant les expéditions de Chine et de Cochinchine,' Paris, 1864, 126; Bernard, 'De l'influence du climat de la Cochinchine sur les malad. des Européens,' Montp., 1867, 40; Saux, 'De l'hépatite des pays chauds,' Paris, 1868; Girard de la Barçerie, 'Consid. sur la Cochinchine, &c.,' Montp., 1868, 34; Danguy des Déserts, 'Consid. sur l'hygiène de l'Européen en Cochinchine,' Paris, 1876, 12; Beaufile, 'Arch. de méd. nav.,' 1882, April, 266.

⁴ Armand, 'Gaz. méd. de Paris,' 1861, 201; Wilson, 'Med. Notes on China,' Lond., 1846, 258, ff. (gives post-mortem results); Friedel, 'Beiträge zur Kenntniss des Klimas und der Krankheiten Ost-Asiens,' Berlin, 1863, 91 (from the records of the Missions Hospital in Shanghai); Duberquoy, 'Notes sur les malad. des Européens en Chine et au Japon,' Paris, 1872, 45; Rochefort, 'Arch. de méd. nav.,' 1873, Avril, 241.

⁵ Maget, *ib.*, 1877, Mai, 357.

parts of the empire it is as rare as in the temperate latitudes of Europe. In the *East Indies*, the coasts of Java, Sumatra and Borneo,¹ and next to them the island of Luchon (Philippines),² are chief seats of the malady; it is much more rarely seen in Banka, Celebes, the Moluccas, the Riouw-Lingga Archipelago, and the Andamans.³ These data regarding the somewhat common occurrence of abscess of the liver, apply, as in India, mostly to the European residents; and the same is true of the hepatitis of *Polynesia*, particularly the Hawaiian Islands⁴ and Tahiti,⁵ where the disease is, however, much more rarely seen than at other places within the tropics. But in New Caledonia, where it was scarcely known formerly, a striking increase of cases has been remarked of late in the French section of the inhabitants.⁶ Lastly, with reference to the geographical distribution of the disease on Asiatic soil, we have to mention its very malignant prevalence among the Europeans resident in tropical parts of *Persia* and *Arabia*, especially along the coasts of the Red Sea and Persian Gulf.⁷

Among African regions severely affected with inflammations of the liver we have to reckon certain of the East African islands, particularly *Réunion*⁸ and *Mauritius*,⁹ in which abscess of the liver is almost as common, according to Tulloch, as in India or on the West Coast of Africa; also

¹ Heymann, l. c.; van Leent, 'Arch. de méd. nav.,' 1867, Septbr., 168, 1868, Septbr., 163, 1870, Jan., 14.

² Sollaud, ib., 1882, Septbr., 166.

³ Douglas, 'Brit. Army Reports for the year 1873,' xv, 326.

⁴ Gulick, 'New York Journ. of Med.,' 1855, March.

⁵ Dutroulau, 'Traité des malad. des Européens dans les pays chauds, &c.,' Paris, 1861, 56; account in 'Arch. de méd. nav.,' 1865, Oct., 285; Hercouet, 'Études sur les malad. des Européens aux îles Taïti,' Paris, 1880, 63.

⁶ See de Rochas, 'Essai sur la topogr. hyg. et méd. de la Nouvelle-Calédonie,' Paris, 1860, 18; Charlopin, 'Notes rec. en Calédonie de 1863 à 1867,' Montp., 1868, 21; Navarre, 'Étude méd. de la presqu'île Ducos,' Paris, 1879, 32; Cousyn, 'Consid. sur la pathologie des troupes d'infanterie de marine en Nouvelle-Calédonie,' Paris, 1883, 45; Brassac, 'Congrès international de méd. des colonies, &c.,' Amsterd., 1884, 316.

⁷ Pruner, l. c., 252; Aubert-Roche, 'Annal. d'hyg.,' xxxiii, 21; Moore, 'Assoc. Med. Journ.,' 1856, Nov., 995.

⁸ Dutroulau, l. c., 50; Lostalot-Bachoué, 'Étude sur la constitution phys. et méd. de l'île Zanzibar,' Paris, 1876, 44; Pellissier, 'Considér. sur l'étiologie des malad. les plus communes à la Réunion,' Paris, 1881, 22.

⁹ Allan, 'Edinb. Monthly Journ.,' 1841, Aug., 561; Tulloch, l. c.

*Madagascar*¹ and *Mozambique*² (the Zanzibar coast less so³). *Nubia*⁴ and *Egypt*⁵ are in the same rank, particularly Upper and Central Egypt; also Algiers, for which the French military surgeons⁶ give much information about the malady, although there are no statistics of the number of cases: it would seem to be more common in the province of Oran than at other parts of the country, such as Constantine in the province of Bona. With reference to abscess of the liver in *Senegambia*, Thevenot says that "l'hépatite pour cela même est plus fréquente et plus grave que partout ailleurs;" and he puts the mortality from it among the French residents at 33 per cent. of the deaths from all causes, or, including the cases secondary to dysentery, at more than 50 per cent. Dutroulau⁷ places it even higher; while Berville,⁸ Mondot,⁹ Gauthier¹⁰ and other authorities give the disease as very common. But here again we have to note that these statements appear to relate only to the European section of the community and to the places on the coast; at all events Collin¹¹ says for Upper Senegambia and Léonard¹² for Sedhiou (on the Casamansa some ninety miles

¹ Borchgrevink, l. c.; Lostalot-Bachoué, l. c.

² Roquette, 'Arch. de méd. nav.,' 863, Mars, 1866.

³ Id.

⁴ Pruner, l. c.

⁵ Vauvray, 'Arch. de méd. nav.,' 1873, Sept., 161; Friocourt, ib., 1884, Août, 87 (this and the former relate to Port Said); Sachs, l. c., for Cairo, where he himself treated thirty-six cases of abscess of the liver in seven years, and saw a good many more in consultation with others; Pissas, 'Congrès des médecins Grecs à Athènes 1882,' Constantin., 1883, 18; Mayer, 'Arch. de méd. nav.,' 1869, Mai, 325 (common in Alexandria).

⁶ Broussais, 'Journ. de méd.,' 1845, Aug., Sept.; Cambay, 'Traité des malad. des pays chauds, &c.,' Paris, 1847; Mouillac, 'Observ. et reflex. sur l'hépatite étudiée en Afrique,' Montp., 1848; Bédié, 'Essai de topogr. méd. sur Biakara,' Paris, 1849; Haspel, l. c., i, 83; Catteloup, 'Mém. de méd. milit.,' 1851, ii, sér. vii, 89, and 'Essai d'une topogr. méd. du Bassin de Tlemcen,' Paris, 1854; Armand, 'Méd. et hyg. des pays chauds, &c.,' Paris, 1859, 347; Rouis, l. c.; Soyard, 'Considér. sur quelques-unes des affections . . . en Algérie,' Montpellier, 1868, 22; 'Traité des malad. des Européens dans les pays chauds,' Paris, 1840, 163, 193, 232, 234, 247.

⁷ L. c., 10.

⁸ 'Remarques sur les maladies du Sénégal,' Paris, 1857.

⁹ 'Étude sur le Sénégal, &c.,' Paris, 1865, 17.

¹⁰ L. c., 17.

¹¹ 'Contribution à la geogr. méd. du Haut-Sénégal,' Paris, 1883, 47.

¹² 'Observ. rec. au poste de Sed'hion, &c.,' Paris, 1869, 61.

from its mouth), that the malady is but rarely seen among the natives. It is equally common and malignant on the *Bight of Benin* and *Bight of Biafra*,¹ the *Slave Coast*,² the *Gold Coast*³ and *Fernando Po*;⁴ but it is much rarer on the coasts more to the south, such as the Gaboon,⁵ and rarer still beyond the estuary of the Congo.⁶

In regard to South America, it is a very remarkable fact, considering the temperate latitude of the country, that *Chili* is subject to abscess of the liver as one of its endemic diseases. It had been pointed out by the earlier authorities⁷ that the malady was much more common in that country than in many tropical regions of America, such as the West Indies; and their statements have been fully borne out by recent writers, such as Petit,⁸ Letellier⁹ and Murillo.¹⁰

In the clinical division of the hospital of San Giovan di Dio at Valparaiso, forty-eight patients with liver complaint were admitted from March 21st to September 22nd, 1870, and seventy-two from March 1st to December 1st, 1872. Among forty subjects sent to the anatomical theatre during six months of 1861, eight were found with an abscess in the liver; and among forty-six cadavers in 1871, there were ten with hepatic abscess.

It is in the north of Chili, both on the coast and in the heart of the country, that the disease is commonest; it becomes rarer towards the south, so much so that in Valdivia, Chiloe and Ilanquihua only occasional cases are seen. On the coast and in the forest region of *Peru* also, inflammation of the liver counts among the diseases of especial frequency¹¹

¹ Boyle, 'Med. Histor. Account of the Western Coast of Africa,' London, 1831, 360; Bryson, 'Reports of the Climate and Diseases of the African Station, &c.,' London, 1847, 252; Daniell, 'Sketches of the Med. Topogr. of the Gulf of Guinea,' London, 1849, 54.

² Férus, 'Arch. de méd. nav., 1879, Mai, 328.

³ Clarke, 'Transact. of the Epidemiol. Soc.,' 1860, i, 108.

⁴ Quetan, 'Arch. de méd. nav., 1868, Févr., 73.

⁵ Griffon du Bellay, ib., 1864, Janv., 61; Monnerot, 'Considér. gén. sur les malad. observées à l'hôpital du Gabon,' Montpellier, 1868, 36.

⁶ Ritchie, 'Edinb. Monthly Journ.,' 1852, June.

⁷ Piderit, 'Deutsche Klinik,' 1853, Nr. 48; Lafargue, 'Bull. de l'Acad. de méd.,' xvii, 189 (he falls into an exaggeration when he says that abscess of the liver is as common in Chili as pulmonary consumption is in France).

⁸ 'Annali della Università del Chile,' 1861, 623.

⁹ Ib., 1873, 197.

¹⁰ 'Rivista Clin. di Bologna,' 1875, Oct., 329.

¹¹ Tschudi, 'Oesterr. med. Wochenschr.,' 1846, 446, 661, 727.

(in Callao it is reckoned as endemic);¹ and the same holds for *Venezuela*, almost the half of the deaths in Merida being attributed to diseases of the liver, part to "indurations," and part to abscess.² The accounts given by Gobini, Sigaud³ and other writers as to the great frequency of abscess of the liver in *Brazil* would appear to rest in part upon errors of diagnosis; at least we are expressly told by Dundas,⁴ a thoroughly trustworthy observer, that the malady is more rarely seen in that country, particularly in Bahia, than in other parts of the tropics; and in a paper by a French practitioner⁵ in Brazil, we read that it is merely professional prejudice which discovers inflammation of the liver so often in that country, and that the malady is so rare among the French community at Rio de Janeiro (numbering 150 to 200), who would naturally be more exposed to it than the natives, that he had had occasion to treat only one case of hepatitis during a period of three years. It is comparatively rare also in *Guiana*, according to Blair⁶ for Demerara, Laure⁷ and Dutroulau⁸ for Cayenne, and v. Leent⁹ for Surinam.

The earlier accounts by Campet¹⁰ and Segond¹¹ of the common occurrence of inflammation of the liver in Cayenne, are considered by Laure to have arisen from confusing the disease with other hepatic affections, particularly those caused by malaria; or, as Dutroulau thinks, it may be that dysentery, which used to be much more common than it is now, had made abscess of the liver also more common.

In striking contrast to the frequency of hepatitis in the tropical regions of the Eastern Hemisphere, is the comparatively small amount of it in the *West Indies*; nearly all the observers agree in this, more especially those for

¹ Account in 'Arch. de méd. nav.,' 1864, Sept., 128; Fournier, *ib.*, 1874, Sept., 153.

² v. Archen, 'Amer. Med. Monthly,' 1857, vii, 25.

³ *L. c.*, 322.

⁴ 'Sketches of Brazil, &c.,' London, 1852, 371.

⁵ 'Gaz. méd. de Paris,' 1848, Nr. 31.

⁶ 'Account of the Last Yellow Fever Epidemic,' London, 1850, 21.

⁷ 'Considér. pratiques, &c.,' 47.

⁸ *L. c.*, 19.

⁹ 'Arch. de méd. nav.,' 1880, Nov., 405.

¹⁰ 'Traité des malad. des pays chauds, &c.,' Paris, 1807, 191.

¹¹ 'Revue méd.,' 1836, Nov.

St. Thomas,¹ Barbadoes,² Martinique,³ Guadeloupe⁴ and other of the Lesser Antilles. The rarity of hepatic disorders in Jamaica had been pointed out formerly by Hunter and Lemprière;⁵ according to twenty years' observations more recently, the whole number of cases of liver-complaint among the troops was only 1 per cent. of the total strength in Jamaica and 2.2 per cent. in the other English possessions, being a lower rate than in Malta and the Ionian Islands.⁶ In Domingo⁷ and Cuba⁸ hepatitis would seem to be more common. From *Central America* there are accounts of its frequent occurrence in Panama,⁹ Punta Arenas (Costa Rica),¹⁰ Guatemala¹¹ and Salvador (particularly at San Miguel);¹² but here again the term appears to have been applied with great laxity.¹³ According to medical reports from Monterey,¹⁴ Acapulco,¹⁵ Guaymas and Mazatlan,¹⁶ the west coast of Mexico would seem to be more subject to inflammation of the liver than the east coast or the eastern declivity of the plateau. In Vera Cruz, Heinemann¹⁷ saw only seven cases of abscess of the liver during a number of years, two of these being in strangers. During the French occupation of Mexico, only a

¹ Barclay, 'Bibl. for Laeger,' 1830, i, 103.

² Jackson, 'Boston Med. and Surg. Journ.,' 1867, July, 4.

³ Langellier-Bellevue, 'Essai sur l'étiologie . . . de la dysenterie endémique de St. Pierre,' Montpellier, 1867; Ruz, 'Arch. de méd. nav.,' 1869, Oct., 269.

⁴ Pellarin, ib., 1868, Juin, 420; Olmeta, 'Contrib. à l'histoire de l'hépatite des pays chauds,' Montpellier, 1868; Batby-Berquin, 'Notes sur quelques malad. observées à la Guadeloupe,' Paris, 1873, 11; Carpentier, 'Arch. de méd. nav.,' 1873, Decbr., 433 (refers particularly to Camp Jacob).

⁵ 'Pract. Observ. on the Diseases of the Army in Jamaica, &c.,' London, 1799, i, 45.

⁶ Tulloch, 'Statistical Reports,' London, 1838.

⁷ Desportes, 'Hist. des. maladies de St. Domingue,' Paris, 1770, ii, 141.

⁸ Navarrete Romay, 'Études des abcès du foie dans la dysentérie chronique,' Paris, 1872, p. 5 (of the preface).

⁹ Account in 'Arch. de méd. nav.,' 1864, Oct. 286.

¹⁰ Ib., Nov., 374.

¹¹ Ib., 379; Bernoulli, l. c.

¹² Guzman, l. c.

¹³ Compare Schwalbe, 'Arch. für klin. Med.,' 1875, xv, 325.

¹⁴ Mears, 'Philad. Med. and Surg. Reporter,' 1874, Aug., 84.

¹⁵ Girard, 'Relat. méd. de la campagne de la frégate le d'Assas dans les mers du Sud., &c.,' Montp. 1868, 13.

¹⁶ Lucas, 'La frégate à hélice La Victoria à Guaymas et à Mazatlan,' Paris, 1868, 39.

¹⁷ In 'Virchow's Arch.,' 1873, lviii, 161.

few of the army medical officers¹ met with cases of hepatitis at all frequently among the troops; most of them² are of the opinion of Jourdanet³ that abscess of the liver is rare there.

In the *United States*, hepatitis entirely ceases to be endemic; it is seen only in occasional cases. That is true even for the Southern States; thus Little⁴ says of Florida: "Acute hepatitis is uncommon in this climate;" and Nott⁵ writes:

"Persons at the North, who have read Johnson 'On the Liver' and other works of English writers on diseases of hot climates, have often, without sufficient investigation, regarded the Southern States as similarly situated; but here we see that in Charleston (and so with Mobile and New Orleans) diseases of the liver are almost unknown, while in Bengal we are told, 'one half the deaths are from diseases of the liver.' I can declare with confidence, and my professional brethren here will sustain me, that I saw fewer diseases of the liver in Mobile than of any important organ in the body. I do not think I exaggerate when I say, that the cases in my practice, belonging to Mobile, do not exceed one a year."

As the northern coast of the Gulf of Mexico forms the limit of hepatic abscess considered as a wide-spread or common disease of the Western Hemisphere; so the Mediterranean forms its corresponding limit in the Old World. In the peninsulas running out from the south of *Europe*, such as Greece,⁶ Turkey,⁷ Southern Italy⁸ and Southern Spain (as in Andalusia),⁹ abscess of the liver is common; but northwards from that line, even in Central and Upper Italy and in the South of France, the malady is very unusual, and seen only in cases here and there.

¹ Poncet, 'Mém. de méd. milit.,' 1863, Mars, 228 (explicitly says that inflammation of the liver is rarely seen at Orizaba under ordinary circumstances).

² Bouffier, 'Arch. de méd. nav.,' 1865, Mai, 535.

³ L. c., 357.

⁴ 'Amer. Journ. of Med. Sc.,' 1845, July, 73.

⁵ 'Southern Journ. of Med.,' 1847, March.

⁶ Valassopoulos, 'Congrès. des méd. Grecs à Athènes 1882,' Constantin., 1883, 23; Stephanos ('La Grèce au point de vue naturel, &c.,' extr. du 'Dictionn. encyclop. des sc. méd.,' Par., 1884, 544) says that most of the cases of hepatic abscess in Greece are found in persons who had come from Egypt. It is only in Lakonia that it can be said to be not altogether rare; in Phthiotis and Boeotia there is more of it owing to the malaria.

⁷ Rigler, 'Die Türkei und ihre Bewohner,' ii, 174; Mühlig, 'Ztschr. der Wien. Aerzte,' 1852, ii, 97.

⁸ Ughetti, 'Rivista clinica di Bologna,' 1884, Decbr., 1067.

⁹ Bertulus, 'Gaz. des. hôpit.,' 1859, Nr. 17.

§ 107. THE INFLUENCE OF CHILL IN THE TROPICS.

Suppurative inflammation of the liver is usually held to be one of the trio of tropical diseases in the stricter sense of the term, the others being malarial fever and dysentery. The foregoing general sketch of the distribution of the malady over the globe shows that the designation is justified. At the same time we may learn from this distribution that *tropical climate* is by no means decisive, singly and in itself, for the production of the disease; that its frequency within equatorial countries varies much under the same sort of climate; that there is a good deal more of it in many regions with a comparatively mild climate, such as Mauritius, Algiers and Chili, than in highly-tropical parts of the world like Jamaica, Guiana, and the south of China; that the sick-rate from it, at various places within one and the same region where it is endemic, is not at all in an exact proportion to their more or less pronounced tropical character; and that almost everywhere the sickness touches its highest point, not in the hot *season*, but in the cold or rainy season.

For example, the North-West Provinces of India and several elevated parts of Madras are much more subject to inflammation of the liver than the plain of Lower Bengal, with its highly tropical climate, or than Bombay. The following table, compiled by Mouat,¹ is interesting as showing the mean temperature along with the sick-rate from hepatitis, at several of the most important military stations in the Madras Presidency:

Table of Admissions for Hepatitis, with the Mean Temperature.

Station.	Mean temp. of the year.	Admission, per 100 men.
Trichinopoly	84° F.	8.7
Wallajabad	83	17
St. Thomas Mount . .	83	4.7
Masulipatam	83	4.9
Madras	83	7.4

¹ 'Madras Quart. Journ.,' l. c.

Station.	Mean temp. of the year.	Admissions per 100 men.
Bellary	83	8.2
Secunderabad	81	14.5
Arni	81	5.7
Arcot	81	13.5
Cannanore	80	8.7
Balgam	76	9.2
Bangalore	74	11.1

As regards the seasonal incidence of the disease, all the Indian authorities¹ agree that the maximum falls at the end of the rains and in the cold season (according to Morehead in February and March, and in November, December, and January). Of 243 deaths from abscess of the liver, 101 or 41.6 per cent. happened in the cold season, 79 or 32.5 per cent. in the rainy season, and 63 or 25.9 per cent. in the hot season (Waring). In Cochin China 48 cases in a total of 51 came under treatment during the rains. Of 51 cases treated at St. Louis, Senegambia, in 1837 and 1838, 31 were admitted from October to March, 11 from April to June, and 9 from July to September, or the hottest part of the year (Thevenot).

From these and other observations of the same purport, made in the West Indies, in Algiers, Chili and elsewhere, it follows that the endemic comes to a height in the season of extreme diurnal *fluctuations of the temperature* (cold nights after a hot day). It is this fact that explains, according to Anglo-Indian writers more particularly, the especial frequency of the disease at those places within the regions of its endemicity, where the weather-conditions give a decided peculiarity to the climate.

"At stations where the days are very hot," says Murray, "and the nights cold, or where the transitions of temperature are great, sudden and frequent, there will be more hepatitis in a corps than where the temperature is uniformly high." In like manner Twining: "The most common exciting causes of hepatitis appear to be diurnal alternations of temperature, which occur in Bengal at the beginning of the cold season."

In Senegambia the disease is at its height in the season

¹ Twining, Murray, Geddes, Annesley, Waring, Morehead.

when the temperature during the day, with a steady wind from the east, reaches the enormous figure of 35° to 40° C. (95° to 104° Fahr.), falling during the night to 18° or 20° C. (64° to 68° Fahr.) and in the morning not unfrequently to 10° C. (50° Fahr.)

"La rareté de l'hépatite à Cayenne," says Laure, "ainsi que sa fréquence au Sénégal, dépend de circonstances opposées dans les deux climats. À la Guayne, où le sol, couvert de forêts, est inondé pendant huit mois, une belle végétation maintient partout l'humidité; la température moyenne annuelle de 28° préserve également de l'excès de chaleur et des transitions brusques . . . À Saint-Louis et à Gorée, le terrain sablonneux ne conservant pas l'humidité, l'air sec et brûlant contient plus de poussière que de vapeur d'eau, la température du jour est extrême, la nuit, elle est froide à cause de rayonnement."

The opinion that extreme diurnal range of temperature is a causal factor in the pathogenesis has been adopted by Johnson, Morehead, Vauvray (Egypt), Vidaillet (Martinique) and Murillo (Chili); also for the West Coast of Africa by Boyle, who would, however, keep the importance of that factor in the etiology within limits, as we may see by the following remark made by him with reference to the distribution of hepatitis in the several sections of the coast:

"Sudden vicissitudes in the weather and in the seasons are common causes of this disease . . . but there must be something beyond all this and high range of temperature, to render a particular part of the world more prolific in the production of this disorder than even its immediate neighbourhood, possessing, perhaps, to all appearances, the like supposed exciting attributes in temperature and localities."

§ 108. SEASON OF HEPATIC ABSCESS NOT ALTOGETHER THAT OF MALARIAL FEVER.

It is highly improbable that any particular *state of soil* stands in causal relation to the degree of frequency of abscess of the liver. Elevation comes into account, as the experience of Algiers (Rioux), Peru (Tschudi) and Mexico (Jourdanet) shows, just in so far as the places at great heights within the tropical or subtropical latitudes have a temperature (analogous to that of colder latitudes) that forbids the endemic occurrence of the malady in any case.

But there are no grounds for the assertion often made, that inflammation of the liver is more common on flat coasts and low plains than on steep shores or high lying regions; for, according to Balfour's information from the Madras Presidency and Hunter's from that of Bombay, it follows that the disease is actually more common at the elevated localities on the slope of the Ghâts than on the coasts or the low plains.

Many observers, such as Haspel, Annesley, Dutroulan, Foiret,¹ Olmeta and Pellissier, have laid special stress for the pathogenesis upon the effect of *marshy ground*; or, in other words, they have taken inflammation of the liver to be a form of *malarial infection*.

Haspel, one of the keenest supporters of that theory, says: "Ces trois maladies [malarial fever, dysentery, and hepatitis] marchent conjointement, s'enchainent de manière à former, pour ainsi dire, un ensemble vivant, que naît sous les yeux de l'observateur, s'accroît pour décroître ensuite et disparaître plus ou moins complètement. Ici les effets touchent de si près aux causes, qu'un coup-d'oeil attentif suffit pour lever toute incertitude à cet regard."

Foiret would regard every spontaneous hepatitis (*i. e.* not dependent on dysentery) as "une hépatite par impaludation." To the same effect Olmeta says: "L'hépatite, c'est la dysenterie du foie . . . une inflammation du foie née sous l'influence du miasme paludéen."

If we must admit, with Soyard, Jean and others, that abscess of the liver arises not unfrequently in persons who are suffering from chronic hyperæmia of that organ as a consequence of long-continued malarial disease, and that the latter affection may in that way predispose to hepatic abscess; still the malarial theory is in conflict with facts, and above all with the fact that abscess of the liver is especially common in many countries which have malarial disease either to a moderate extent, such as Egypt, or are exempt from it altogether, such as Chili;² and in conflict with this other fact, that the most intense malarious districts in tropical countries are far less subject to hepatitis than places near them which are affected by malaria in a minor degree, Lower Bengal being a classical example in one way, and Madras in the converse. Haspel himself cannot but admit

¹ 'Causes et lésions de l'hépatite suppurative,' Paris, 1860.

² But see vol. i, p. 222.

that, in Algiers, abscess of the liver is commonest in the province of Oran, where malarial diseases are least widely spread, while it is much rarer in Bona, as well as in the province of Constantine generally, although that is one of the worst centres of malaria in the whole country. Bertulus, who shares the views of Haspel, is constrained to admit that hepatitis is endemic also in dry, sandy, and otherwise non-malarious regions of the tropics; and although Pellissier adduces as evidence of the malarial nature of hepatic abscess, the fact of its endemic co-existence with malarial diseases in Réunion, he has disregarded the other fact that abscess of the liver had been at all times indigenous in that colony, whereas malarial fever did not break out and become endemic there until 1866 (see vol. i, 275). Moreover, it is worthy of note that the largest number of cases of hepatitis falls in the season of the year when malarious influences are least felt; and that, in the worst centres of malaria, in the temperate zone, or even in the subtropical zone, such as many parts of France, the Tuscan Maremma, the Calabrian coast, the southern basin of the Danube and the swamps of the Mississippi, abscess of the liver is one of the forms of disease most rarely seen.

§ 109. INFLUENCE OF ALCOHOLIC DRINK.

By far the larger number of observers are agreed that the most material influence in producing inflammation of the liver is undoubtedly something unsuitable in the *nutrition*; that is to say, either a diet not adapted to the tropical climate, or addiction to *absolutely noxious foods or beverages* known from experience to have a specific irritant action on the organ, the abuse of *alcoholic drinks* taking first place. They are further agreed that these noxious influences display their morbid powers all the more decidedly, the more they find a congenial ground of action in a liver predisposed through the effects of climate to fall into deeper disorder.

“Among the various influences,” says Annesley, “which more directly occasion the supervention of inflammatory action of the liver, there are few more energetic than the immoderate addiction to the use of

spirituous liquors and intoxicating drinks, which may be so readily obtained by the European soldier in every part of India."

Bontius had formerly spoken to the like effect, and the opinion has been adopted by many later writers: such as Johnson, Twining, Day, Milward, Waring, Parkes and other Anglo-Indian authorities; Heymann and v. Leent for the East Indies, Marshall for Ceylon, Saux for Cochin China, Allan for Mauritius, Brassac for New Caledonia, Vauvray and Sachs for Egypt, Rouis and Mouillac for Algiers, Olmeta for Martinique, and Tschudi for Peru. Among the British troops in India, until not very long ago, drunkenness was enormously prevalent; Nicoll tells us that in one regiment, to which he was attached as surgeon, the admissions for hepatitis were excessive during the three-and-a-half years when it was stationed at Quilon (Travancore), and that the real cause was neither more nor less than the incredible drunkenness of the men, which came to such a pass that in every ten reported as sick, at least nine were suffering from alcoholism or its immediate effects. Henderson, who was surgeon to a regiment at Cannanore in 1832, says that the soldiers on arriving there began to improve materially in health after the bad climate of Bellary, their previous station, but that the improvement was soon lost in consequence of a drinking mania that took possession of them, hepatitis carrying off many. "I must own," he goes on to say, "I never witnessed such drunkenness as took place in the corps shortly after our arrival and for several months . . . At one time no less than three hundred gallons¹ of the pernicious liquor ('toddy') were consumed daily in our barracks. . . . The effects of this may be more easily conceived than described." Vauvray has seen most cases of abscess of the liver in Egypt among the Greeks, who are especially addicted to drink; and Sachs says, from an experience of many years in that country: "Alcoholic drink constitutes in almost every case the direct etiological factor in the disease which is the subject of my observations" ('Ueber die Hepatitis der heissen Länder'); and he says again: "What alcohol is for the chronic inflammatory processes of the liver in

¹ The regiment numbered 700, so that there would be an average of three-sevenths of a gallon, or nearly two quarts of the liquor, to each man.

cold countries, it seems to be for the acute hepatitis of hot climates. According to our figures, it is by far the most usual reason why hyperæmia, such as may easily arise from the climate or from the use of stimulating food, passes into inflammation and abscess."

There remain to be mentioned two things that are especially noteworthy in this connexion. Of recent years the cases of hepatitis among the British troops in India, particularly in Bengal, have become rather less common. Macpherson would explain that through the greater consideration shown by the authorities for the soldier's mode of life, including his dietary, and through the consequent improvement in his habits. Bryson assigns the same reason for the notable decrease in the cases of hepatitis of late among the troops on the West Coast of Africa, the soldier's daily ration of rum, as he tells us, having been formerly twice as much as at the time of his writing. Along with that fact we may take another adduced by Daniell (and to be further dealt with), namely, that hepatitis has become commoner among the natives on the West Coast since the time when brandy became an article of barter with them. This brings us to the second noteworthy circumstance in relation to the question of drink and hepatitis, namely, the very great difference in the number of cases among different nationalities and classes of the people, and between the two sexes. I shall discuss these differences in the following section.

§ 110. EUROPEANS MOST LIABLE, BUT NOT THE WOMEN.

In all parts of the world where abscess of the liver has the character of an endemic malady, it is the immigrant *European residents* that mostly suffer. This comes out most decidedly, as all authorities agree, in India, Ceylon, the East Indies and China.¹

In the Madras army from 1829 to 1838, the admissions for hepatitis among the British troops were to those in the native regiments in the ratio of 120 to 1 (Balfour); and from 1842 to 1859 in the ratio of 100 to 2·1 (Cornish). For the Bombay army Morehead gives the proportion

¹ Rose, 'Pacific Med. and Surg. Journ.,' 1862, Oct.

as 100 to 2. It is at the same time noteworthy that the relative proportion of deaths from abscess of the liver was a good deal higher among the native Indian troops than among the British. Among the sepoys they amounted to 9·1 per cent. of the whole number, and among the British soldiers to only 4·6 per cent. In the European Hospital at Bombay 14·1 of the cases of hepatic abscess ended fatally, but in the Native Hospital 34 per cent. of them.

We find the same preponderance among Europeans, as contrasted with the native population, in Senegambia, Egypt, the West Indies and elsewhere; but the difference is less in these countries, the cases among the natives, and particularly among *negroes* (in Réunion, the West Coast of Africa, in negro regiments of the British service in Ceylon and the West Indies) being relatively more frequent than among the Asiatic races.

That these differences in the amount of abscess of the liver among various *nationalities* are not to be referred to racial peculiarities, will seem credible from the fact that the ratio of cases among the British troops in India is greatest in the lower ranks of the service, the malady being rare among the officers; and the same fact presents itself on the West Coast of Africa and in the West Indies, where it is again the common soldiers and the labouring class that suffer most; also in Egypt, where the disease is oftenest met with among working people, Greeks especially. At the same time there is no doubt a good deal of significance in the fact already mentioned, that strangers in a tropical climate are apt to develop hyperæmia of the liver, which would be a predisposing cause of the inflammatory affection of the organ. But even that factor is not decisive for the production of hepatitis, as will appear from the extreme rarity of it in the *female sex*, including women who have come to the tropics from other countries and are subject to the same climatic influences as the men. In 300 deaths from abscess of the liver in India tabulated by Waring, 29 were of males and 9 of females (including 6 native women, Hindu or Mohammedan, and 3 Anglo-Indian). In Algiers, according to Rouis, the proportion of men to women was 250 to 8. No doubt, as Sachs rightly says, too much weight should not be attached to these figures, for the reason that

they are got from military communities, and the total number of men and women respectively is not given. Experience would be more decisive in the civil population, as based upon a nearly equal number of both sexes; and the following facts of that sort are given by Sachs for Egypt:

"Of the 36 patients whom we had under close observation, 34 were men and 2 women; of other cases of abscess in the liver seen by us in Egypt but not specially taken note of, which numbered full as many more, we do not remember a single one in a woman. Dr. Nerontsos-Bey collected 46 cases of abscess of the liver among Europeans in Egypt during twelve years (from 1852 to 1855 at Cairo, and from 1858 to 1865 at Alexandria); none of these was in a woman. Of 10 cases tabulated by Dr. Ogilvie-Bey in Alexandria 1 was in a woman, and more recently Dr. De Castro, in the same city, had 2 female cases out of 10. In a work by De Castro ('Des Abscès du foie,' Paris, 1870) there is a table of 170 cases of abscess of the liver, including those above mentioned, from the practice of other practitioners in Alexandria, and among these 8 were in women."

"This circumstance," says Sachs in conclusion, "is so striking that it ought to be taken as an etiological factor of the greatest importance, and made use of in explaining the occurrence of abscess of the liver on altogether different grounds than by writers hitherto. It leads us to look beyond the general causes in operation for both sexes alike, and to assume some special cause which will account for the remarkable preponderance of this malady in men."

Among these circumstances special to the male sex, it seems to me, as I have already indicated, that an unsuitable mode of life or of nutrition, including more especially intemperance in alcoholic drink, takes a chief place. It is easy to explain in this way the comparative immunity of the Hindu populations of Eastern Asia, with their well known extreme sobriety of diet and their abstinence from alcohol. Henderson says that the few cases of hepatitis that he has seen among the middle class natives of India were not in Hindus but in Mohammedans, "who were permitted by religious prescription to live luxuriously," and these either the well-to-do who kept a luxurious table or drunkards. Conwell, who had a large experience to draw upon, also lays most stress on that factor in the etiology. He compares the mode of living of the British troops in India, who had

every day three abundant meals, consisting in great part of animal food and six ounces of arrack, with the simple diet of the natives consisting of rice, mutton or fish, and plain water, the taste for brandy, gin and liquors of that kind, being altogether alien to them. And he adds: "Judging from the dissections which I have made, I am of opinion that hepatic complaints are rare among the natives of good habits . . . The natives employed as servants in European barracks, and some domestics, who acquire European vices, are equally or more subject to hepatitis." Howison is constrained to refer the remarkable rarity of hepatitis among the British troops at Aden in 1831 to the circumstance that the soldiers were exposed as little as possible to hard service during the heat of day, and that they were obliged to lead a very sober life from their narrow means. The rare occurrence of inflammation of the liver among the British troops in the West Indies is to be explained, according to Tulloch, by the fact that they live much more temperately than in India, especially in the matter of drink.

"In the countries of Islam," says Sachs, "and in Egypt more particularly, where nearly all the natives abstain from spirituous liquors on religious grounds, and only a small fraction are in such a position of material prosperity as to know anything of the luxuries of the table, we have an opportunity of finding out correctly the effect of ingesta, and more especially of alcoholic drink, upon the production of abscess of the liver. While that malady is quite unusual in Arab hospitals and among the Mohammedan population of the country, being found only in persons who have confessedly been addicted to the abuse of alcohol, I have been able during a period of about seven years to collect from among the non-Mohammedan residents of Cairo, who may number some 20,000, a not inconsiderable series of cases, in nearly all of which the principal cause has been the free use of spirituous liquors. Of the two women in my list, one was a true votary in the service of Bacchus and Venus; and of the men, the larger number were heavy brandy-drinkers, some were sots, and only a few were temperate enough to restrict themselves, apart from their regular wine at meals, to small potions of liquor now and then."

§ 111. THE CONNEXION WITH DYSENTERY.

Great as is the importance that we should attach to these statements and to many more like them from Ceylon, the

East Indies, New Caledonia, the West Coast of Africa, Algiers and Peru; yet we should in my opinion fall into onesidedness if we were to discover the only cause of the endemic prevalence of the malady within the tropics in the mischief wrought by drink. Unquestionably there are other excitants of the liver that can produce the same effect whenever a predisposition to the disease has been created in the individual through the influence of climate.

It is well known that, in temperate latitudes, the occasion for the production of sporadic abscess of the liver may be gall-stones, hydatids or embolic infarcts, acting so as to set up inflammation. In that group of causes, special stress has been laid on metastatic infarcts in the liver, following ulceration or gangrenous disintegration of the intestinal mucous membrane; and from facts of that kind Budd¹ has worked out a theory that *in the tropics, the endemic prevalence of abscess of the liver is causally connected with the dysentery that is likewise endemic in those regions.*

This doctrine, although the foundation laid for it by Budd himself was a rather scanty one, was received at once with great applause. But in recent times it has encountered much opposition on the part of observers; and in fact neither statistics nor the due consideration of other matters of experience in the endemic hepatitis of the tropics, are in its favour. If is, of course, not to be denied that dysentery and abscess of the liver are not unfrequently seen together in one and the same person. In the following table I have made as complete a collection as possible of the statistical data on the coincidence of the two diseases in the same subject, as revealed on post-mortem examination:

¹ 'Diseases of the Liver,' Lond., 1845, p. 49.

Table of the Frequency of Hepatic Abscess in Cases of Dysentery.

Authority.	Locality.	Total deaths from dysentery.	Concurrent abscess of liver.
Ranking . . .	India . . .	140	41
Waring . . .	" . . .	259	69
Ballingal . . .	" . . .	35	4
Eyre . . .	Madras . . .	118	27
Moore ¹ . . .	Bombay . . .	494	90
Stovell . . .	" . . .	129	25
Macpherson . . .	Calcutta . . .	293	46
Chuckerbutty ² . . .	" . . .	39	3
Marshall . . .	Ceylon . . .	247	49
Arthur . . .	Burmah . . .	20	7
Taylor ³ . . .	" . . .	53	8
Bourgarel ⁴ . . .	Cochin China . . .	22	7
Gayme ⁵ . . .	" . . .	13	6
Julien ⁶ . . .	" . . .	108	8
Wilson . . .	China . . .	61	2
Bédié . . .	Algiers . . .	10	6
Catteloup . . .	" . . .	240	47
Letelier . . .	Chili . . .	46	10
Roulet ⁷ . . .	Rochefort . . .	50	2
		2377	457

This gives a ratio of 19·2 cases of concurrent abscess of the liver in every hundred fatal cases of dysentery. At the same time we are not told how many of the cases had the two affections coexisting but independent, or in how many of them the hepatitis had preceded the dysentery. The latter question is of particular moment, inasmuch as Annesley, Geddes and others declare that *abscess of the liver is a frequent occasion of dysentery*; which explains their use of the

¹ 'Transact. of the Bombay Med. Soc.,' 1862, new. ser., viii, 262.

² 'Indian Annals of Med. Sc.,' 1865, xix, 90.

³ *Ib.*, 1854, April.

⁴ 'De la dysenterie endémique de la Cochinchine française,' Montp., 1866, 32.

⁵ 'De la dysenterie endémique dans la Basse-Cochinchine,' *ib.*, 1866, 50.

⁶ 'Aperçu sur les lésions anatomiques de la dysenterie en Cochinchine,' Montp., 1864, 54.

⁷ 'Étude sur les principaux caractères de la dysenterie chronique des pays chauds,' Paris, 1870. These fifty fatal cases of dysentery occurred in French soldiers who had acquired the disease in the tropics and had been admitted to the Military Hospital of Rochefort.

term "hepatic dysentery." Ballingal¹ says, in explanation of his figures included in the above table :

"The dissection of every subject who died of dysentery in the regimental hospital at Penang, with one solitary exception, proved the disease to consist entirely in an inflammatory affection of the large intestines, without a trace of disease in the structure of the liver."

In an account² of the disastrous epidemic of dysentery among the British troops at Wallajabad in 1807 we read :

"From an examination of almost all the men who have died of dysentery in the regiment, it can hardly be said that the disease is connected with visceral derangement, for in only one case was the liver found suppurated."

Bleeker,³ in his excellent work on dysentery in the Malay Archipelago, speaks of hyperæmia and "altération granuleuse" of the liver as the most frequent complication of that malady; but he makes no mention of hepatic abscess. Cameron⁴ says that, according to his Ceylon experience, dysentery is very rarely complicated with abscess of the liver. Of 41 cases of hepatic abscess under observation in Cochin China, Foiret⁵ gives dysentery as antecedent in 12; but, as in other statements of the kind, we are not told how long an interval there was between the two diseases. Arthur observes with reference to his seven cases of hepatic abscess coincident with dysentery as given in the table, that there were many more cases of suppurative hepatitis altogether unconnected with dysentery. Sachs gives the following summary of his observations on the point in Egypt: In 48 cases of hepatic abscess, 28 had no dysentery, 11 had dysentery but in no causal connexion with the hepatic disease, and in only 9 could dysentery be shown to have been the immediate antecedent. If we consider, further, that dysentery is very common among the natives of tropical countries (among Hindus and Mohammedans in India and among the native population of Egypt), while abscess of the liver is very rare; that the female sex in the tropics is subject to

¹ L. c., 76.

² 'Edinb. Med. and Surg. Journ.,' 1809, Oct., 398.

³ 'La dysenteria, &c.,' La Haye, 1856, 21.

⁴ 'Med. Times and Gaz.,' 1853, Oct. 365.

⁵ 'Causes et lésions de l'hépatite suppurative,' Paris, 1860.

dysentery as much as the male, but is almost exempt from abscess of the liver; and, lastly, that in countries outside the tropics severe epidemics of dysentery are far from uncommon, although abscess of the liver from whatever cause counts as one of the rarest of maladies, and as a sequel of dysentery rarer still¹—if we keep these things in mind, we shall have to admit that, although abscess of the liver is a rather common complication of dysentery, and the two affections may in many cases be even causally related to each other, we are by no means warranted in concluding from the facts as we have them that dysentery is the real occasion of hepatic abscess being endemic in the tropics.

§ 112. ALLEGED IMMUNITY THROUGH ACCLIMATISATION.

The assertion has been often made, and support sought for it in statistics, that Europeans long resident in the tropics may acquire a degree of *immunity from abscess of the liver by acclimatisation*. It is impossible to form an opinion on the point from the figures before us. The numerical data as to the sick-rate among sections of the population who have varied in the length of their residence, apply only to European troops; and for these we have only the absolute number of admissions or of deaths, without respect to the total number of individuals in the community; so that it is impossible to calculate the percentage of sickness, which is the thing that we want. Any conclusion drawn from the figures such as they are would be all the more fallacious for the reason that a body of European troops after five to seven years' service in the tropics would be considerably reduced in numbers by death or by the drafting of invalids home.

¹ Altschul ('Prager med. Wochenschr.,' 1884, Nr. 20, p. 204) found abscess of the liver in only one instance out of 297 fatal cases of dysentery examined *post mortem* at the Pathological Institute of Prague from 1880 to 1884. Burkhardt ('Berl. klin. Woch.,' 1872, No. 26) found abscesses in the lungs and spleen five times (twice in the lungs alone), but in the liver not once (nor even an infarct), in upwards of eighty fatal cases of dysentery at the Military Hospital of Nancy.

CHAPTER XIII.

MISCELLANEOUS ABDOMINAL DISORDERS.

§ 113. GEOGRAPHICAL FACTS ABOUT CIRRHOSIS, &C., AND GALL-STONES.

For other diseases of the liver we have very little information about the geographical distribution, which can be said to be in the least degree trustworthy through *post-mortem* verification.

Cirrhosis of the liver (interstitial hepatitis), which is not exactly common even in temperate latitudes, is found all over the world under the same circumstances as in the former, that is to say as a result of excess in the use of alcohol ; as an outcome of the malarial cachexia it is more rare (Frerichs for Germany, Salvagnoli-Marchetti and Cantani for Italy, Stephanos for Greece). The more special accounts of it from tropical countries such as *India*,¹ *Egypt*,² and the *West Indies*³ lead us to conclude that the disease is less common in them than in higher latitudes, and that it is found mostly in Europeans. The reason of this, Sachs thinks, is that the abuse of alcohol in that climate will mostly cause suppurative inflammation of the liver ; Maclean, again, explains it by the fact that drunkards do not have a long life in the tropics, not long enough for cirrhosis of the liver to get fully developed. The rarity of cirrhosis among the Hindus and Mohammedans of India, Egypt, and other countries, is accounted for by their abstinence from strong drink.

Fatty liver.—The comparatively common occurrence of

¹ Morehead, l. c., 131 ; Cornish, Stovell, Auboeuf, l. c. ; Taylor, 'Ind. Annals of Med. Sc.,' 1854, April, 419 ; Maclean, 'Brit. Army Med. Report,' 1862, 442.

² Pissas, Sachs, ll. cc.

³ Levacher, Ruz, ll. cc. ; Courtenay, 'Lancet,' 1881, Nov., 868.

this condition in the natives of tropical countries, mostly as a disorder of nutrition following severe malarial disease, chronic dysentery and the like, is reported from *India*,¹ *Cochin China*² and *New Caledonia*.³ It is often seen also in Europeans resident in India, as a consequence of luxurious living.⁴

Amyloid disease of the liver, as an outcome of constitutional syphilis, but also as a result of the malarial cachexia and of scrofula, is given as one of the conditions often seen in *India*,⁵ the *East Indies*,⁶ and *Egypt*.⁷ Van Leent speaks of it as being remarkably common in very young children in the Dutch East Indies.

Cancer of the liver.—Whether this infection is equally common in all parts of the temperate zone cannot be made out from the statistics, as these come exclusively from the hospitals of large towns. In the tropics it appears to be very rare, like cancer in general. The authorities for *Egypt*, *Algiers*, the West Coast of Africa and other regions make no reference to it; Webb, a competent judge in such a matter, says that he had not seen a single case during many years' work at morbid anatomy in Calcutta;⁸ Nachtigal⁹ would describe it as very rare in the Soudan, from his experience at Murzuk in the oasis of Fezzan; and Ruz had no case of it in his practice at Martinique during thirteen years.

Gall-stones.—The absence of statistics makes it difficult to form an opinion of the relative frequency of gall-stones at the various places within the temperate zone. Haller's¹⁰ idea that the malady was endemic in certain parts of Germany (especially at Göttingen and in Swabia), as well as in England and Hungary, appears to be based on arbitrary dicta which authors have repeated one after another. At all events I

¹ Mackay, 'Ind. Annals of Med. Sc.' 1856, Apr., 550; F. N. Macnamara, *ib.*, 1852, May, 5.

² Danguy des Déserts, 'Considér sur l'hygiène de l'Européen en Cochinchine,' Paris, 1876, 12.

³ Boyer, 'Arch. de méd. nav.' 1878, Septbr.

⁴ F. N. Macnamara, 'Ind. Annals of Med. Sc.' 1855, Oct.

⁵ Maclean, l. c.; Morehead, l. c., 145.

⁶ v. Leent, 'Arch. de méd. nav.' 1880, Nov., 405.

⁷ Hartmann, l. c.

⁸ L. c., 266.

⁹ 'Sahara und Sudan,' ii Theile, Berl., 1879, 1881, i, 148.

¹⁰ 'Opuscula pathol.' Observ. xxxiii, Lausanne, 1755, 70.

can find no confirmation of it in the sources to which I have access.

According to Bollinger¹ gall-stones were found in the Munich dead-house in 6·3 per cent. of a total of 1034 bodies, Roth's figures for Basle giving 8·8 per cent. (2028 bodies), and Fiedler's for Dresden 7 per cent. (4300 bodies). The proportion of males to females in the gall-stone cases at each of those three hospitals was 3·9 to 9·9, 4·7 to 11·7, and 4 to 9·6; so that the condition is two or three times commoner in women than in men. Sedentary habits appear to be a real cause,² perhaps also the wearing of stays tight enough to mark the liver.

In tropical countries gall-stones are decidedly less common than in higher latitudes. Morehead³ saw only four cases during many years' practice in India; Ruz did not meet with a single case in Martinique; and Borchgrevink had the same experience in Madagascar. Pruner says that in Egypt they are rather more common in Europeans and Turks than in natives and negroes; and Hartmann speaks of the malady in that country as being very unusual in any class.

Epidemics of Jaundice.

§ 114. SOME RECORDED EPIDEMICS OF JAUNDICE, MILITARY AND OTHER.

In recent times, and more particularly since about the year 1850, it has been often observed that jaundice has occurred in epidemics. Many of these epidemics had been confined within small and definite circles, others had extended to larger sections of the population, and still others had been diffused over wide tracts of country. Again, some of them have had a duration of only a few weeks, while others have dragged on for several months and even longer. In the following list, which is, I think, a tolerably complete embodiment of all the details hitherto published, I have put together in chronological order the various epidemiographical

¹ 'Deutsche med. Wochenschr.,' 1884, 109.

² See Crisp, 'Lancet,' 1841, Decbr., 11.

³ L. c., 146.

accounts known to me, although I have for the most part not gone beyond European sources.

Our earliest information about epidemic icterus comes from Minorca, where the malady was prevalent during July and August, 1745: to what extent, is not mentioned.¹ Next in order comes an epidemic on the Ligurian coast, which was noticed from January to March, 1793, at Genoa and along the coast to Nice, as well as at Monferrato, while the inland districts to the east of Genoa escaped it altogether.² Then follows a narrative of an outbreak of jaundice from August to November, 1794, in the small town of Lüdenschel (in the county Mark), although the parish with the townships of the peasantry kept quite free from it.³ From November, 1807, to February, 1808, it was reported as epidemic at Greifswald.⁴ For the next twenty-four years there are no references to it; it is not until 1841 that we hear of it again as having been prevalent from October to December at Lissieux, Chasselay and other places in the department of the Rhone.⁵

After 1852 the accounts of it begin to be more numerous, although they relate mostly to smaller circles. From September to November of that year jaundice was epidemic in Birmingham, exclusively among children.⁶ In the autumn of 1854 there was an outbreak in the garrison of Anise, among troops that had been transferred from Montpellier, the town's people remaining quite exempt.⁷ In July, 1857, there was a small house-epidemic at Mainz, which confined itself to the womankind of one family and ended in a fortnight.⁸ Over a large area the malady was prevalent in several districts of Sweden from July to November, 1858, particularly in the districts of Carlstad, Oroust and Wennerborg, cases of jaundice continuing to be remarkably common

¹ Cleghorn, 'Obs. on the Epid. Diseases in Minorca 1744-9, &c.,' 4th ed., Lond. 1779, German ed., Gotha, 1776, p. 139.

² Batt, 'Memor. della società med. di emulazione di Genova,' 1801, tom. i. primo quadrimestro, 63.

³ Kercksig, in 'Hufeland's Journ. der Hlkde.,' 1799, vii, Stück 3, 94.

⁴ Mende, ib., 1810, Aug., 79.

⁵ Chardon, 'Journ de méd. de Lyon,' 1842, Févr., 148.

⁶ Barker, 'Assoc. Med. Journ.,' 1854, Jan., 80.

⁷ Dumas, 'L'Union méd.,' 1861, Nr. 143.

⁸ Stitzer, 'Wien. med. Presse,' 1876, Nr. 14, 464.

as late as the beginning of the next year.¹ In December, 1859, the disease appeared among the French troops at Civita Vecchia, in a detachment occupied upon earth-works.² The same year there was a severe epidemic of icterus from May to October in the central prison of Gaillon (47 cases and 11 deaths);³ and another in winter among the civil population of Limoges, in which many pregnant women suffered, some of them severely.⁴ From August to October, 1860, the malady was prevalent among the French troops in Pavia, as well as among the inhabitants of the town.⁵ In the autumn of 1861, it was epidemic in the vicinity of Bartenstein (Württemberg), equally among the elevated and low-lying villages.⁶ For 1865 there are three notices of it in French garrisons: among a company in the Lourcine barracks (49 cases from 25th July to 17th August, some of them serious);⁷ among the men in the garrison of Arras;⁸ and among the guards corps at St. Cloud, also of a serious type.⁹ At Hanau from August, 1868, to February, 1869, there were 39 cases of jaundice, 31 in children and 8 in adults; outside the town not a single case came to notice.¹⁰ In the autumn of 1870, many cases were seen in Paris, both among the ordinary residents and among the military;¹¹ from February to May of the following year, the malady was prevalent among the Bavarian troops occupying the south-west of Paris (799 cases in a force of 33,380 men);¹² and in the winter of 1871-72, jaundice again became somewhat general in Paris.¹³ In March and April, 1872, it appeared among the garrison of Wesel, but was limited to certain divisions

¹ Sver, 'Sundhets-Collegii Berättelse år 1858,' 74, 1859, 78.

² Fritsch, 'Epidémie d'ictère grave développée à Civita-Vecchia Strasb.,' 1861.

³ Carville, 'Arch. gén. de méd.,' 1814, Août.

⁴ Bardinot, 'Gaz. méd. de Paris,' 1863, Nr. 45, 732.

⁵ Martin, 'Mém. de méd. milit.'

⁶ Röser, 'Württb. med. Correspdzbl.,' 1861, Nr. 43, 343.

⁷ Laveran, 'Gaz. hebdom. de méd.,' 1865, N. 37, 1678, and 'Mémoires de méd. milit.,' 1866, Janv., 18.

⁸ Rizet, *ib.*, 1867, Juill, 17.

⁹ Worms, *ib.*, 1865, Juill.

¹⁰ Rehn, 'Jahrb. für Kinderhikde.,' 1870, N. F., iii, 197.

¹¹ Decaisne, 'Compt. rend. de l'Acad. des sc.,' 1871, lxxiii, Nr. 26.

¹² Seggel, 'Deutsche militär-ärztl. Ztsch.,' 1872, i, 89.

¹³ See, 'Gaz. des hôp.,' 1872, Nr. 26, 201.

of the troops.¹ For 1874 we have several notices of the epidemic malady: at Wetzlar in July and August in two rooms of the barracks on the same corridor;² in the village of Hausenstamm, near Offenbach-on-the-Main, where there were 40 cases in a population of 1400 during the autumn and winter;³ at Soest from February to May in a battalion garrisoning the place;⁴ and at Basel from August, 1874, to May, 1875, 200 cases somewhat uniformly distributed among the population of 50,000.⁵

Other epidemics among the military are the following: at Neu Breisach in the spring of 1875;⁶ in the small town of Sulz in Alsace in February and March, 1877, confined to two companies;⁷ at Lille in the same year, in one of the barracks, being in part of a severe type;⁸ at Rastatt⁹ in February and March, 1878; Constance¹⁰ at the same time; in a French garrison¹¹ (not named) in 1880; at Frankfurt-on-Main in a regiment of the garrison for a whole twelvemonth (Feb., 1883, to March, 1884);¹² and in 1885 among the garrison of Trebinje, Herzegovina, where many cases occurred among the patients in the hospital beside the large number of soldiers admitted with jaundice, and where the epidemic extended beyond the elevated fortifications around the town to remote stations of the cordon, and appeared even among the civil population, although it spared the children.¹³ With these military epidemics there should be mentioned the outbreak of jaundice from October, 1883, to April, 1884, among the employés of a shipbuilding and outfitting yard at Bremen; there were 200 cases in a total of 1200 to 1500 workmen, while in the city at large there were only casual cases during the same period.¹⁴

For countries out of Europe we have very scanty infor-

¹ Köhnhorn, 'Berliner klin. Wochenschr.,' 1877, Nr. 7, 8.

² Stitzer, l. c., Nr. 17, 571.

³ Klingelhöfer, 'Berl. klin. Wochenschr.,' 1876, Nr. 6, 76.

⁴ Lindemann, 'Deutsche Ztschr. für pract. Med.,' 1874, Nr. 45.

⁵ Hagenbach, 'Correspdzbl. für Schweizer Aerzte,' 1875, Nr. 19, 545.

⁶ Fröhlich, 'Arch. für klin. Med.,' 1879, xxiv, 394.

⁷ Ib.

⁸ Arnould, 'Mém. de méd. milit.,' 1878, Mars, Avril.

⁹ Fröhlich, l. c.

¹⁰ Fröhlich, l. c.

¹¹ Eudes, 'Arch. de méd. milit.,' 1883, i, 35.

¹² Kranz, 'Arch. f. Hygiene,' 1884, ii, 471.

¹³ Pick, 'Prager med. Wochenschr.,' 1884, Nr. 29.

¹⁴ Lürman, 'Berliner klin. Wochenschr.,' 1885, Nr. 2, 20.

mation about epidemics of icterus; among them are the outbreak at Smyrna in 1871-72, when the malady became general throughout the population from October to March;¹ and an epidemic in India (place not mentioned) in 1849 among the men of an English regiment.² In Egypt epidemics of that kind would appear to be not uncommon in autumn.³ In the United States jaundice was observed to be epidemic to a great extent among the Federal troops during the Secession War; the following are the figures given in Circular No. 6:

Region.	No. of men.	Cases of jaundice.	Deaths from jaundice.
Atlantic . . .	1,087,041	21,963	37
Central . . .	1,101,758	20,497	124
Pacific . . .	29,160	109	0

There is mention also of an epidemic in the winter and spring of 1869-70 in some localities of Eastern Tennessee.⁴ It is not unfrequently epidemic in Martinique;⁵ in 1858 it assumed a pernicious type there in some cases of pregnancy, but was otherwise mild.⁶

§ 115. THE TYPE OF THE DISEASE.

In most of these epidemics the malady ran the course of a simple catarrhal icterus; or it showed the marked signs of gastro-duodenal catarrh complicated with jaundice; or, as in the epidemic among the Austrian troops at Trebinje in 1855, it was complicated with stomatitis ulcerosa. In some other epidemics, such as that of the Lourcine garrison in 1865 and the garrison of Lille in 1877, it took the form of a severe bilious-remittent fever. In still others there were

¹ Diamantopulos, 'Wien. med. Presse,' 1872, Nr. 42.

² Arnot, 'Transact. of the Bombay Med. Soc.,' 1st ser., x, 28.

³ Pissas, 'Congrès des médecins Grecs à Athènes,' Constant., 1883, 18.

⁴ McGaughey, 'Philad. Med. Times,' 1872, Aug. 407.

⁵ Ruz, l. c.

⁶ Ballot, 'Gaz. des hôpit.,' 1859, Nr. 62.

observed, in addition to attacks of average severity, some cases of icterus gravis (acute yellow atrophy) with hæmorrhages, and cases with nervous symptoms: such as at Limoges and the prison of Gaillon in 1859, in the garrison of St. Cloud in 1865, the garrison of Aniane in 1854, and in Martinique in 1858; the noteworthy thing being that these fatal cases at Limoges and in Martinique were observed only in pregnant women. In the prison-epidemic at Gaillon, the diagnosis of acute yellow atrophy, where made, was confirmed on examination after death.

§ 116. SEASON AND WEATHER OF NO CONSEQUENCE.

It does not appear from the facts before us that *season* and *weather* have any real influence on the existence or the frequency of the disease. Of 27 epidemics with their duration somewhat precisely stated, 5 occurred in spring, 1 in spring-summer, 4 in summer, 3 in summer-autumn, 1 in autumn, 1 in autumn-winter, 8 in winter, and 1 in winter-spring; so that the malady has been seen seven times in spring, eight times in summer and in autumn, and ten times in winter, while four epidemics (Basel 1874-75, Hanau 1868-69, Frankfurt-on-Main and Bremen 1883-84) lasted over long periods. In some of the military epidemics, as at Sulz in 1877, Rastatt in 1878 and Trebinje in 1885, the getting chilled and wet is given as the cause of the malady; while in others that etiological factor cannot be proved, and in still others the epidemic went on unchanged amidst variations of the weather. In judging of that point it should also be borne in mind that the disease usually remains limited to one place, or even to one section of a place (as in the Bremen ship-yard), or to definite groups of the inhabitants; while the whole district around, or the adjoining sections of the community, subject to the same weather-influences, have escaped altogether.

§ 117. INFLUENCE OF MONOTONOUS DIET; SPECIFIC CAUSES.

Thirty-four epidemics of jaundice have been enumerated above. Of these fifteen were confined to bodies of troops; one was in a ship-yard, one in a house, and one in a prison; twelve were in a town or village (one of these, at Birmingham in 1852, being confined to children); and four were over a wider area, namely, that of 1793 on the Ligurian coast, 1841 in the Dept. du Rhône, 1858-59 in Sweden, and 1860 in the vicinity of Bartenstein. From this it follows that the pathogenesis, in the larger number of cases, is an affair of purely local influences; and the experience of several of the epidemics warrants the supposition that these influences are not unfrequently of the *dietetic kind*. Thus, the epidemic of 1883 in the Frankfurt garrison appears to have been set up by the use of bad pease overgrown with mould; that of 1872 among certain sections of the troops in the garrison of Wesel to the continued diet of pork and pease, the monotony of the diet having been highly objectionable to the men; again at Soest in 1874 and at Rastatt in 1878, to bad diet; among the Bavarian troops before Paris in 1871 to the monotonous diet (salt beef and mutton, with rice, but no fresh vegetables), the malady ceasing when fresh provisions arrived; among the troops in the Lourcine and St. Cloud garrisons owing to the use of impure drinking-water, the latter epidemic coming to a sudden end when the water was changed. In all such cases the malady appears to have been essentially of gastric origin, that is to say, associated with ordinary gastric or gastro-duodenal catarrh.

But for other epidemics, such as those of Bremen, Hanau, Basel, and Trebinje, noxious influences of that kind have to be excluded decidedly from the etiology. Least of all can they be alleged for those epidemics where the malady has been widely prevalent; and in cases of that kind we should probably not err if, in consideration of the circumstances amidst which the disease had arisen, we seek the cause of it in a *specific infection*. Thus, at Arras in 1865, it broke out in a soldiers' barrack which was exposed to the emanations

from a pit filled with putrefying matters; and it appeared again a year after in that and an adjoining barrack when the pit was cleared out and the putrid effluvia thus stirred up. Under the same circumstances (a moat filled with stagnant filth from drains and other sources) an epidemic occurred in the barracks of Neu Breisach in 1875. The Indian epidemic of 1849 happened in a regiment which was encamped, with its tents in close order, on a piece of damp ground tainted with dead animals and other putrefying matters. Stitzer gives the following account of the house-epidemic at Mainz in 1857: The disease was in one family only, of which five female members fell ill, while all the males, as well as the other inmates of the house and residents of the neighbourhood, escaped. The one cause discoverable on inquiry was the emanations from a choked drain-pipe, which communicated by its upper end with the kitchen of the particular family, so that only the women-folks were exposed. No new cases occurred after the nuisance was put right. The cause of the epidemic among the employés of the Bremen ship-yard, where the influence of weather, bad drinking-water, food, or anything else in the mode of living was absolutely excluded, is conjectured by the writer upon it to have been an infection due to vaccination with bad lymph. Re-vaccination of all the employés in the yard had been ordered in consequence of some small-pox cases among them. Between the 13th of August and the 1st of September, 1289 persons were vaccinated by six doctors with humanised lymph in glycerine, and of these 191 took jaundice in the course of a few weeks. Other doctors vaccinated 87 of the men away from the yard, and of the latter none took jaundice; again, among 500 other workmen who were vaccinated at the same time with a different lymph, there was not a single case of it. It is remarkable that the incubation-period, or the time between the vaccination and the appearance of jaundice, extended to several weeks and even to a couple of months.

Although the etiology of epidemic jaundice is not fully cleared up, it appears to be certain that the malady may originate in various ways. In evidence of an infective character inhering in it, we may adduce the occasional

occurrence of icterus gravis along with milder cases, such as has been seen in Martinique, at Limoges, St. Cloud and other places mentioned above.

Ruptures.

§ 118. RELATIVE FREQUENCY OF RUPTURES IN VARIOUS COUNTRIES.

A brief sketch of the *geographical distribution* of ruptures may appropriately follow the sections on diseases of the digestive organs. The materials for this purpose, although very scanty, yet present to our notice many interesting points of view.

There is no question that ruptures, and, as we shall see, some forms of them in particular, are much more common in certain parts of the world than in others, being indeed remarkably common therein. For *Europe*, this applies, so far as our information goes, to some mountainous parts of *Bohemia*, such as the circles of Bidschow¹ and Leitmeritz;² also to certain localities of *Styria*³ and of *Roumania*:⁴ according to a calculation by Müller in 1811, the number of ruptured persons in the frontier districts of Wallachia and Illyria was 1080, or one forty-fifth of the population, so that the lesion has there an endemic character. (In what has been said, and in what is to follow, it is mostly inguinal and femoral ruptures that are meant.) In many parts of *Switzerland*, also, hernia is common, being indigenous to the small cantons in the centre of the country (Zug, Schwyz, Uri, Unterwalden).⁵ The number of ruptured persons in

¹ Streinz, 'Oest. med. Jahrb.,' Nst. Folge, iii, 343.

² Cartellieri, ib., 1843, Juni, 354.

³ Pilz, ib., 1848, März, 328, August, 221; Macher, 'Med. Topogr. des Herzogth. Steyermark,' Graz, 1860, 152.

⁴ Dobronrawow in Hecker's 'Annal. der wissensch. Hlkde.,' xxxi, 341; Müller, 'Oest. med. Jahrb.,' 1843, Decbr., 343.

⁵ Freytag, 'Diss. de oscheo-, entero- et bubonocoele Helvetiae incolis frequentibus,' Argentor., 1721; Blumenbach, 'Medicinische Bibliothek,' i, 725; Stadlin, 'Schweiz. Arch. der Med.,' Jahrg. i, Heft 2, 81.

Turkey.¹ Hennen mentions that a surgeon of large practice in Malta had assured him that one-third of all the individuals of his acquaintance suffered from hernia.

From the continent of *Asia* we have accounts of the exceptionally common occurrence of the condition in question in the mountain valleys of *Syria*,² in some parts of *India* (the information³ comes from the French possessions on the Coromandel coast), and most of all in *China*,⁴ where intestinal ruptures are perhaps commoner than in any other part of the world, especially among the lower classes. Among the natives of Cochin China the malady would appear to be rarer than among the European residents.⁵ Again in some of the islands of the *Pacific*, such as *Fiji*⁶ and *New Caledonia*,⁷ ruptures occur very frequently among the natives. The same holds, according to the unanimous testimony of a number of observers, for *Egypt* and the *Soudan*,⁸ as well as for the negro countries of Africa generally—for the natives of *Senegambia*,⁹ *Cape Coast*¹⁰ and the Bights of *Benin* and *Biafra*,¹¹ for the Kroomen, Grebus, and other negro tribes on the shores of the *Niger*,¹² and for the inhabitants of many parts of *Central Africa*.¹³

Hernia in the negro is mostly umbilical; and that form of it is met with in them not merely in their native seats but also seen remarkably often in negro colonies such as

¹ Rígler, 'Die Türkei und deren Bewohner, &c.,' ii, 207.

² Robertson, 'Edinb. Med. and Surg. Journ.,' 1843, April, 247, 1845, October, 354.

³ Huillet, 'Arch. de méd. nav.,' 1868, Fevr., 21; Auboeuf, 'Contributions à l'étude de l'hygiène et des malad. dans l'Inde,' Par., 1881, 68.

⁴ Dudgeon, 'Glasgow Med. Journ.,' 1877, July, 304; Henderson, 'Edinb. Med. Journ.,' 1877, Aug., 126.

⁵ Beaufls, 'Arch. de méd. nav.,' 1882, Avril, 297.

⁶ Fox, in Wilkes' 'Narrative of the U. S. Exploring Expedition.'

⁷ de Rochas, 'Essai sur la topogr. hyg. et méd. de la Nouvelle-Calédonie,' Par., 1860, 18.

⁸ Clot-Bey, 'Aperçu géner.,' &c.; Pruner, l. c., 241; Hartmann, l. c. □

⁹ Ref. in 'Gaz. des hôpit.,' 1839, Nr. 123; Chassaniol, 'Arch. de méd. nav.,' 1863, Mai, 518.

¹⁰ Duncan, 'Travels in West Africa,' Lond., 1847, i, 80.

¹¹ Daniell, 'Sketches, &c.,' Lond., 1849, 96.

¹² Thomson, in Trotter's 'Narrative of the Expedition to the River Niger,' Lond., 1848.

¹³ Marshall, 'Edinb. Med. and Surg. Journ.,' 1832, Oct., 347.

Cayenne.¹ Umbilical ruptures often attain a great size in the negro; they appear at an early age, are borne throughout life without any real inconvenience or special hindrance to work, and regarded rather as a distinction of the figure than as a defect. "Umbilical hernia," says Daniell with reference to the negro, "is rather viewed in an ornamental light; and some people, under this idea, allow the intestines to protrude to a considerable extent." I have not found any independent confirmation of the statements of Varnhagen² and Pleasants³ that ruptures are more common in *Brazil* than in the United States.

§ 119. CONGENITAL LAXITY OF PARTS AS A CAUSE.

Inquiring into the causes that exert a determining or favouring influence on the occurrence of ruptures, or that stand in some definite relationship to their frequency, we have first of all to keep in mind that the condition depends either upon congenital abnormalities of the abdominal wall, in consequence of which the apertures and canals are wider and protrusion of the intestines made possible, or upon pressure continually exerted by the intestines upon those outlets, so that at length their passive dilatation is brought about and the formation of rupture ensues. Our experience of the circumstances under which ruptures are most commonly met with is found to be in accordance with that twofold theory of causation.

The view of Robertson, Rigler, Segond and others, that the enervating effect of heat in low latitudes produces a "laxity" or "lowered tonicity of the tissues" and thereby creates a special disposition towards rupture, as well as the opinion of Clot-Bey that the immoderate use of warm baths in the East, particularly in Egypt, has that effect, I consider to be unproven and not very probable. A principal reason for the endemicity of the lesion may be found, I think, in

¹ Segond, 'Journ. hebdomadaire des progrès des sc. méd.' 1835, Jan.; Hille, in Casper's 'Wochenschrift für die ges. Hkde.' 1839, 581.

² 'Hamb. Mag. der ges. Hkde.' iv, 367.

³ 'Amer. Journ. of Med. Sc.' 1842, July, 88.

the *national inheritance of anatomical peculiarities especially favorable to the development of the condition*, a view that Blumenbach is disposed to adhere to so far as concerns the very common occurrence of rupture in Switzerland.

"As to the factor that we must regard as at least the most important predisposing cause of rupture in Switzerland," he says, "it is a hereditary disposition for which the way has been prepared many years before; every day I become more convinced of the undeniable competence and effectiveness of that. Richter, in his work on rupture, has supported the doctrine by some instances, within his knowledge, of hernia being hereditary even in families; how much more, therefore, in a country where the defect has grown to be uniformly endemic by reason of so manifold and profound causes, such as I shall designate more particularly in the sequel."

The state of things may be the same, as Chassaniol suggests, with the umbilical ruptures of the negroes, although it is perhaps not necessary to resort for an explanation to any special racial peculiarity as cause of the malady. I give that view as a conjecture; but I think there is some support to be found for it in the very remarkable fact that, in those regions where herniæ are particularly common or endemic, strangulation is very rare, the ruptures being mostly reducible by taxis, and operation called for only in exceptional cases.

Thus Pilz, when speaking of the endemic prevalence of rupture in the Styrian district of Leitzen, informs us that the taxis nearly always suffices in strangulation, and goes on to say: "Very old surgeons have assured me that they have, in every case from the beginning to the end of their practice, found the taxis sufficient, and have never resorted to the operation for strangulated hernia." Robertson speaks of strangulation as being "a very rare occurrence" in Syria. Clot-Bey and Pruner are agreed that in Egypt the incarceration of ruptures is as rare as the reduction of them is easy; and that is also the statement of Varnhagen and Pleasants for Brazil. Hille says that, notwithstanding the enormous frequency of ruptures, particularly of umbilical ruptures, in Cayenne, and in spite of the want of all cure in the treatment of them, there has never been a case of strangulation there. Segond entirely agrees with him, both as regards the great rarity of incarceration and the extremely slight risk from it in that country: "Il en est tellement ainsi, que de tous les étranglements observés depuis douze ans par les chirurgiens actuellement sur les lieux, un seul a résisté aux efforts bien combinés du taxis; l'opération n'ayant pas été tentée, le malade succomba. On s'étonne vraiment de ce que, parmi le nombre prodigieux de nègres atteints des hernies, pas un cas d'étranglement opiniâtre ne se présente ;

cependant ces hommes ne portent pas de bandage ou l'appliquent d'une manière vicieuse, s'adonnent à de rudes travaux et font usage des plus grossiers alimens. Quoiqu'il en soit, pas d'étranglement du côté des anneaux ou arcades, pas de resserrement de la part du collet du sac."

§ 120. BODILY STRAIN AS A CAUSE.

Another etiological factor of the endemicity of abdominal ruptures, we shall have to seek for in those influences which act in the second of the two ways above indicated, that is to say, when they come to tell upon a considerable part of the population of a locality. This is the explanation adopted by several of the authorities above named, for the *preponderance of ruptures in mountainous regions*. It is not merely the strain in ascending and descending the mountains, but still more the carrying of heavy burdens, that has to be taken into account. Blumenbach comments specially on that point in his remarks, already referred to, on the prevalence of the lesion in some parts of Switzerland.

He calls attention in the first place to the very violent exertions that are so often required in barking trees, moving stones, and the like; and next to the "powerful efforts needed in some kinds of Alpine labour, such as carrying hay. The labourers stagger under trusses of two hundred-weight and upwards, after twisting themselves to get the load on their backs. Having put a rope round the heap of hay, they lie back on the bundle, having the ends of the rope over their shoulders; then throwing the legs up they fall forwards on their knees, so that the whole weight of hay may come upon the shoulders and back."

The same explanation has been suggested by other observers for the frequent occurrence of rupture among those populations or sections of a population who are liable to particularly *severe bodily strain* at their work in other circumstances. In this connexion it is noteworthy that hernia has often been observed among women in parts of the country where it is the custom for them to carry the children on their backs, being all the while occupied with some kind of hard work. Praslow calls attention to the unusual frequency of right inguinal hernia among gold washers in California; and he finds the cause to be the peculiar strain on the body in that kind of work, which consists chiefly in taking shovelfuls of

sand from the bottom of the pit and shaking them from right to left.

On the assumption that the inheritance of a predisposition to hernia has a foundation in anatomical conditions, we shall be able to understand how it is that in regions where the last-mentioned etiological factor is always operative to induce the lesion, rupture may be met with even in those who are not directly exposed to the injurious influence itself.

Enlargement of the Spleen.

§ 121. ENLARGEMENT OF THE SPLEEN MOSTLY MALARIAL.

Diseases of the spleen have had no other interest hitherto for pathology from the geographical point of view than in so far as they go with malaria. In the form either of acute or of chronic enlargement, accompanying malarial fever or following it, or as an idiopathic malarial disease independent of fever, the splenic malady is more or less widely distributed, or may even be endemic, in all those parts of the world where malarial fevers are indigenous to a great extent, that is to say, where permanent centres of malaria, or the specific cause underlying the fevers, are found. This form of splenic disease, accordingly, is not only coincident exactly with the distribution of malarial fevers, but everywhere it keeps pace with the latter closely in their extent and severity of type. As Sigaud rightly says: "Elles se règlent sur les fièvres intermittentes."

In largest numbers, therefore, we find these splenic tumours in the great marshy districts of tropical and sub-tropical countries: in *India* and *Further India*, according to the writings of Voigt,¹ Annesley,² Webb,³ Raleigh,⁴ Forbes,⁵

¹ 'Bibl. for Laeger,' 1834, 281.

² L. c., 312.

³ L. c., 142.

⁴ 'India Journ. of Med. Sc.,' 1840, 204.

⁵ Ibid., 1841, new ser., ii, 191.

Macquerra,¹ Henderson,² Postans,³ Twining,⁴ Gordon⁵ and others. They mostly occur in Lower Bengal, in the North-Western Provinces within the basins of the Ganges and Juma, in Lower Sind, and in the marshy plains of Arcacan; less commonly, and in proportion to the distribution of malarial fever, in the Presidencies of Madras and Bombay.

As regards the frequency of the condition in Bengal it appears from the paper of Macquerra that 227 cases of enlargement of the spleen had been observed in eight years among a force of 156,139 men, giving a ratio of 15 per 1000. In the report of the dispensaries in Bengal and the North-Western Provinces, which concern the natives chiefly, we find that there were 322 cases of splenic tumour among 2000 patients from August, 1840, to January, 1842.

Similar information on the endemic prevalence of the malady, along with malarial fever, comes from the *East Indies*,⁶ *Arabia and Egypt*,⁷ the *East African Islands*,⁸ the *West Coast of Africa*,⁹ *Algiers*,¹⁰ *Brazil*,¹¹ *Cayenne*,¹² *Mexico*,¹³ *Central America*¹⁴ and the *West Indies*.¹⁵ Splenic tumour as an outcome of malarial sickness forms also an important element in the statistics of sickness from the malarious regions where the climate is merely to be considered warm: such as the littoral of *Syria*, *Transcaucasia*,¹⁶ *Turkey*,¹⁷ *Greece*,

¹ 'Indian Annals of Med. Sc.,' 1858, January, 241.

² 'Edinb. Med. and Surg. Journ.,' July, 33.

³ 'Personal Observ. on Sindh,' Lond., 1843.

⁴ L. c., i, 391, and 'Calcutta Med. Tr.,' iii, 351.

⁵ Gordon, 'Ind. Annals of Med. Sc.,' 1864, April, 52.

⁶ 'Half-yearly Report of the Dispens. in Bengal and the North-Western Provinces,' Calcutta, 1843.

⁷ Heymann in 'Würzb. Verhandl.,' v, 48; v. Leent, 'Arch. de méd. nav.,' 1867, Sept., 170.

⁸ Pruner, l. c., 262.

⁹ Allan in 'Edinb. Monthly Journ.,' 1841, August, 562.

¹⁰ Boyle, l. c., 397; Sigaud, l. c., 342.

¹¹ Haspel in 'Gaz. méd. de Paris,' 1854, 629; Soyard, 'Considérations sur quelques-unes des affections . . . en Algérie,' Montp., 1868, 26.

¹² Sigaud, l. c.; Aschenfeld, in 'Hamb. Zeitschr. f. Med.,' xxxviii, 273.

¹³ Bajon, 'Nachrichten, &c.,' iii, 1.

¹⁴ Heinemann in 'Virchow's Arch.,' 1873, Bd. 58, 161 (Vera Cruz).

¹⁵ Lidell in 'New York Journ. of Med.,' 1852, July, 94; Bernhard in 'Deutsch. Klin.,' 1854, Nr. 8.

¹⁶ Ruz, 'Arch. de méd. nav.,' 1869, Oct., 269 (Martinique).

¹⁷ Reinhardt in 'Hecker's Annal. der Heilkde.,' xxxiii, 433; Popoff ('Med. Ztg. Russl.,' 1854, 374) says that a healthy spleen is a rarity in the Caucasus.

¹⁸ Rigler, l. c., ii, 188.

the Hungarian¹ levels of the Danube, the plains of the Moldau, parts of Italy such as the Tuscan Maremma, and the Central and Southern *United States of America*.² Even in higher latitudes, as in the marshy districts of France and the Netherlands, and the Central depressions of Germany and Russia, the malady from its commonness deserves in many places the name of an endemic; although for these as well as for most of the countries before mentioned, our evidence consists not so much in the very meagre direct statistics as in the numerous accounts of the endemic or epidemic prevalence of malarial fever, wherein enlargement of the spleen is nearly always referred to as an after-effect, not unfrequently as a permanent result of the fever, and as the cause of the dropsies that so often ensue.

§ 122. CLIMATIC CONDITIONS ARE THOSE OF MALARIAL DISEASE.

The connexion between splenic enlargement and malarial fevers is itself evidence of the effect of the climate and state of the soil on the prevalence of the former.

In regard to the rate of sickness among the various *races*, the same fact comes out as in malarial fevers, that the native races in the tropics, particularly the negroes, have by no means that immunity which some observers have claimed for them. Thus Sigaud remarks that he found chronic enlargement of the spleen very common among the negroes imported into South America from the West Coast of Africa, and not seldom an extreme degree of it. Allan also has often seen it among the negroes in the East African Islands. It is very common, again, among the Indians and creoles in the marshy districts of Brazil; Bajon says that there is more of it among the creoles in Cayenne than among the whites. Among the natives of India it has an altogether enormous diffusion; Forbes, for example, says of the district of Hidgelee in the delta of the Ganges: "You scarcely meet a native

¹ Drasche, 'Maladies du foie et de la rate, &c.' Par., 1860.

² Tebault, 'Amer. Journ. of Med. Sc.,' 1856, Jan., 26, April, 377 (London Bridge, Va.); Heustis, 'Amer. Journ. of Med. Sc.,' 1830, May, 73 (Alabama).

who has not the mark of the cautery in his left side;¹ Henderson observes than in some malarious regions of Hindostan, every third person has an enlarged spleen; while Twining and others hold the same sort of language. Gordon dwells upon the enormous size that the spleen may reach in the natives, rupture of the organ being unusually common in them although exceptional in Europeans.

§ 123. CHILDREN MOST LIABLE; PARTLY AN AFFAIR OF RICKETS.

Another noteworthy fact is the commonness of malarial enlargements of the spleen in *children in India*,² both native and of European parentage. Most of these cases are really malarial, and the malady is often fatal through the inter-currence of noma.³ On the other hand these splenic tumours of children may be the outcome of other disorders of nutrition; thus they often occur in the course of *rickets* and as a complication of that disease. The same fact is reported from Egypt, Greece and other countries, and will be further referred to under rickets.

§ 124. A FORM OF IT IN LITHUANIAN CHILDREN, PROBABLY SYPHILITIC.

A peculiar enlargement of the spleen in children under the age of three years, especially Jewish children, has been described by Löwenstein⁴ as an endemic malady of *Lithuania* where it is known under the popular name of "*rib-cake* (*Rippkuchen*). The spleen often attains a colossal size; the children fall off in condition a good deal at the same time and not unfrequently there is enlargement of the liver also. The description⁵ which the author quoted gives of the an-

¹ The cautery, as is well known, is in great repute among the natives of India for all sorts of maladies, including enlargement of the spleen.

² See the papers by Voigt, Webb, Raleigh, Twining, Gordon and Henderson ('Med. Times and Gaz.,' 1854, Feb., 154).

³ See p. 274 of this volume.

⁴ 'Med. Ztg. Russl.,' 1846, Nr. 38, 302.

⁵ *Ib.*, 1850, Nr. 8, 59.

tomical examination, in the case of a child eighteen months old, seems to point to amyloid disease. In favour of that view is the fact that syphilis and scrofula of the parents are specially mentioned as causes of the disease, in addition to filth, bad food, and other debilitating things.

CHAPTER XIV.

DISEASES OF THE HEART AND VESSELS.

I. *Heart-Disease.*

§ 125. VAGUENESS OF THE GEOGRAPHICAL DATA.

The materials for discussing the diseases of the organs of circulation from the geographical point of view are very limited in medical literature ; and, in so far as concerns the questions special to the various forms of these maladies, the observations are trustworthy only to a small extent. Statistics¹ that could be utilised for an even approximate measure of the frequency of these maladies at various parts of the globe are not to be had ; the estimates of authorities are expressed for the most part in such terms as "common" or "rare," corresponding to the fact of a certain average amount of the disease as it is found in the temperate zone of Europe and America. From the materials at our service we can do no more than conclude that the diseases of the circulatory system, and more especially the *commoner forms of heart-disease*, are somewhat uniformly distributed over the globe, being as common in polar and tropical countries as within the latitudes with a temperate climate.

¹ The data as to the death-rates from diseases in this group, derived from a number of large cities or whole countries, are for the most part mere summaries, and are wanting in trustworthiness as well. Nor do the reports of hospitals afford us a safe means of estimating the frequency of these diseases among the population of the place to which they relate ; or at least they are not available as comparative statistics. That holds good also for army medical reports, and for the results deduced from the recruiting lists of certain countries, inasmuch as both of these concern only the males of a particular age, and because the returns on which they are based have neither been made from a uniform point of view nor always with the same care and certainty.

That is the opinion expressed, on the one hand, by all the authorities for *Iceland*,¹ *Sweden*, the northern regions of *Russia-in-Europe*,² *Russia-in-Asia*,³ and *Alaska*;⁴ and, on the other hand, for *Turkey*,⁵ *Persia*,⁶ *Central Arabia*,⁷ many parts of *India*,⁸ the *East Indies*,⁹ the southern and south-eastern ports of *China*,¹⁰ the *Marquesas*,¹¹ *New Caledonia*,¹² and other island-groups of *Polynesia*, and for *Australia*¹³ and *Tasmania*.¹⁴

According to statistics collected by Cullen¹⁵ on the diseases of the organs of circulation among the British troops, the deaths from that cause were 1·20 per 1000 men at the home stations, and the same on foreign service; in 1869 the death-rate among the troops in the Madras Presidency was 1·95 per 1000, in Bengal 1·75, and in Bombay 1·71, an excessive rate of mortality from heart-disease which had previously been remarked upon by Ranking (l. c.) for Madras. Webb, who had both clinical and post-mortem experience to draw upon, and whose opinion is therefore especially trustworthy, says that heart-disease is common in India and is a "prominent feature in the general pathology of the country." The great frequency of heart-disease in Australia is

¹ Schleisner, 'Island, &c.,' Kjöbenh., 1849.

² Blofeld, 'Petersb. Journ. für Natur- und Hlkde.,' 1842, Nr. 4.

³ Maurin, 'Arch. de méd. nav.,' 1877, Août, 84, for Vladivostok (Russian Manchouria).

⁴ Blaschke, 'Topogr. med. portus Novi-Archangelensis,' Petropoli, 1842, 66.

⁵ Rigler, 'Die Türkei, &c.,' ii, 253; Beyran, 'Gaz. méd. de Paris,' 1854, 342; Sandwith, 'Assoc. Med. Journ.,' 1854, May, 435.

⁶ Polak, 'Zeitschr. der Wien. Aerzte,' 1859, 140.

⁷ Palgrave, 'Union méd.,' 1866, Nr. 20, 308.

⁸ Webb, 'Pathologia indica,' Lond., 1849, 67, and Hinder, 'Ind. Annals of Med. Sc.,' 1854, Oct., 69 (Bengal); Parry, 'Madras Quart. Med. Journ.,' 1841, July, 143; Cleveland, ib., 1863, Jan., 27, and Ranking, ib., July, 62 (Madras); Hunter, 'Transact. of the Bombay Med. Soc.,' n. s., i, 239, ii, 23, v, 47, and Morehead, 'Clinical Researches on Disease in India,' Lond., 1856, ii, 422 (Bombay); McGregor, 'Observations on the Principal Diseases in the N.-W. Provinces of India,' Calcutta, 1845, 202 (N.-W. Provinces); Collier, 'Transact. of the Bombay Med. Soc.,' n. s., vii, App., xxxvi (Sind). According to Curran ('Dubl. Quart. Journ. of Med. Sc.,' 1871, Aug., 101) heart disease is rare on the southern slope of the Himalayas.

⁹ Heymann, 'Darstellung der Krankh. in den Tropenländern,' Würzb., 1855, 167; accounts in 'Arch. de méd. nav.,' 1864, Sept., 172, 1868, Sept., 163.

¹⁰ Hobson, 'Med. Times and Gaz.,' 1861, Decbr., 633; Rochefort, 'Arch. de méd. nav.,' 1873, Avril, 241.

¹¹ Clavell, ib., 1884, Août, 152.

¹² Boyer, ib., 1878, Sept., 227.

¹³ Bourse, ib., 1876, Juin, 454; account in 'Brit. Med. Journ.,' 1871, Oct., 446.

¹⁴ Milligan, 'Transact. of the Calcutta Med. Soc.,' viii, App. x.

¹⁵ 'Brit. Med. Journ.,' 1883, May 26th, 997.

shown by the fact that 77 of all the patients in the Melbourne Hospital in 1869 were admitted for cardiac complaints.

Heart-disease is reported as comparatively frequent in such regions of African soil as *Madagascar*,¹ *Egypt*,² *Tunis*,³ *Senegambia*,⁴ the *Gold Coast*,⁵ and the *Cape*,⁶ in which last it has been unusually common among the British troops. From the tropical and sub-tropical regions of the Western Hemisphere we have information of the same purport for *Mexico*⁷ (especially the tierra fria and tierra templada), for *Havana*,⁸ *Brazil*,⁹ Buenos Ayres, Entre Rios, Salta and other provinces of the *Argentine Republic*; ¹⁰ for *Chili* (where all observers agree that heart-disease is unusually frequent),¹¹ the coast of *Peru*¹² and *San Francisco*.¹³

§ 126. PALPITATION COMMON IN THE TROPICS.

Nervous palpitation holds a prominent place among the more common cardiac disorders of lower latitudes. The details concerning it that come to us from *India*,¹⁴ the *East Indies*,¹⁵ *Cochin China*,¹⁶ *Egypt*,¹⁷ the *West Indies*¹⁸ and *Peru*¹⁹

¹ Borchgrevink, 'Norsk Mag. for Laegevidensk,' 235.

² Pruner, 'Krankh. des Orients,' 291, 316; Griesinger, 'Arch. für physiol. Hlkde.,' 1853, xii, 557; Isambert, 'Gaz. méd. de Paris,' 1857, 224; ref. in 'Arch. de méd. nav.,' 1869, Mai, 327.

³ Friecourt, ib., 1884, Juill., 16. ⁴ Chassaniol, ib., 1865, Mai, 510.

⁵ Clarke, 'Transact. of the Epidemiol. Soc.,' 1862, i, 113.

⁶ Schwarz, 'Zeitschr. der Wien. Aerzte,' 1858, 630; Fritsch, 'Arch. für Anat. und Physiol.,' 1867, 733; Lawson, 'Brit. Army Reports for the Year 1866,' 548.

⁷ Jourdanet, 'Le Mexique, etc.,' p. 341; Coindet, 'Mém. de méd. milit.,' 1866, Mai, 424, 1869, April, 273.

⁸ Sullivan, 'Med. Times and Gaz.,' 1871, April, 452.

⁹ Sigaud, 'Du climat et des maladies du Brésil,' Par., 1844, 306; ref. in 'Gaz. méd. de Paris,' 1848, Nr. 31.

¹⁰ Mantegazza, 'Lettere mediche sulla America meridionale,' Milano, 1860, i, 19, 100, 115, ii, 209.

¹¹ Lafargue, 'Bull. de l'Acad. de méd. de Paris,' 1851, 189; ref. in 'Arch. de méd. nav.,' 1864, Août, 105; Miquel, 'Anales de la Universidad de Chile,' Santiago, 1855, 494; Boyd, 'Edinb. Med. Journ.,' 1876, Aug., 110.

¹² Smith, 'Edinb. Med. and Surg. Journ.,' 1840, July, 16.

¹³ Bourse, 'Arch. de méd. nav.,' 1876, Juin, 454.

¹⁴ Cullen, l. c., 1171.

¹⁵ Ref. in 'Arch. de méd. nav.,' 1867, Septbr., 172.

¹⁶ Richaud, ib., 1864, Mai—Juin, 354.

¹⁷ Griesinger.

¹⁸ Rufz, 'Arch. de méd. nav.,' 1868, Oct.

¹⁹ Smith.

serve to show that the affection depends essentially upon the *state of anæmia* to which Europeans are prone (especially such as had been reduced by antecedent disease), owing to the action of the tropical climate and an inappropriate mode of life, including over-exertion and the abuse of spirituous liquor; but if the anæmia should be in countries where *anchylostoma duodenale* is indigenous, such as Egypt and the West Indies, it may be connected with the so-called endemic chlorosis associated with that parasite.

In Cullen's papers on the health of the army in Madras, we find the frequent occurrence of palpitation among a detachment of troops at Bellary in 1870 referred "chiefly to the high temperature acting on men whose constitutions had been impaired by previous disease or intemperance, and upon young soldiers recently arrived in the country." The report from Cannanore in 1879 mentions, in addition to the effects of the climate, "the habits of the men in drinking and smoking to excess;" and special attention is called to the fact that palpitation was particularly common in one regiment which had been stationed for several years preceding on the Malabar coast, and had come to Cannanore "in a very cachectic condition." There are statements of the same purport from Peshawur and other garrisons in British India. It is noteworthy also that palpitation and "cardiac muscular exhaustion" was remarkably common in the army of the Potomac during the American Civil War; in which instance, again, it is suggested¹ that anæmia had probably been an essential condition for the malady.

§ 127. DILATATION AND HYPERTROPHY UNDER SPECIAL CIRCUMSTANCES.

Dilatation and hypertrophy of the heart, often observed in India, the East Indies, Cochin China, Egypt, the West Indies, Brazil and other countries, is connected with, and, in part at least, the direct consequence of the palpitation due to anæmia. This is the opinion of the authorities already quoted for those countries, as well as of other writers.

But more important for the comparative frequency of hypertrophy of the heart in some parts of the world or in certain circles of the population, are those influences upon the vascular system that are in steady operation or are fre-

¹ Hartshorne, 'Amer. Journ. of Med. Sc.,' 1864, July, 89; Taylor, 'Transact. of the Amer. Med. Assoc.,' 1867, xviii.

quently repeated, and that produce an increased action of the heart either directly or through their effects upon the arterial circulation. Foremost in this class we have the prevalence of the disease in *mountainous regions*, which may be explained by the strain on the body, and more particularly on the respiratory and circulatory organs, during the ascent of mountains. We have detailed information on this head from the table-lands of Persia¹ and Mexico,² and from the Italian Alps³ and some mountainous parts of Germany. Thus, the Würtemberg recruiting-lists show that heart-disease is relatively commonest in the circles of the Jaxt and the Black Forest, and specially in the more elevated districts;⁴ and Ozlberger⁵ calls attention to the strikingly frequent occurrence of cardiac hypertrophy among the mountaineers of Upper Austria. To what extent, if at all, the same etiological factor may have influenced the frequency of the disease among *miners*, and particularly among *coal-miners*,⁶ cannot be settled, for the reason that other causes have to be allowed for, especially the chronic pulmonary disorders that are of general occurrence among those classes of people. On the other hand there is no doubt that bodily strain plays an important part in causing the relatively large amount of heart disease among *soldiers*. Of that subject a very thorough study has been made by English⁷ and German⁸ military surgeons, who are agreed in their conclusion, that the bodily strain incidental to the service (and especially, as Fräntzel emphasises, to active service), together with the

¹ Polack, l. c.

² Jourdanet, l. c., 341; Coindet, l. c.

³ Parola, 'Saggio di climatologia e di geogr. nosol. dell'Italia,' Torino, 1881, 489; Ferraris ('Giornale delle sc. med. di Torino,' ii, 391) says that cardiac dilatation and hypertrophy is as common in the valley of Varaita (Apennines) as are the goitre and cretinism which are endemic in it.

⁴ Riedle, 'Beitr. zur med. Statistik Württembergs,' Tüb., 1834.

⁵ 'Oesterr. med. Jahrb.,' 1844, Decr., 363.

⁶ See the accounts by Alison ('Lancet,' 1841—1842, ii, 161) for East Lothian, by Forbes ('Transact. of the Prov. Med. Assoc.,' iv, 203) for Cornwall, and by Buisson ('Étude méd. sur l'ouvrier houilleur,' Par., 1866), on the diseases of coal-miners in France.

⁷ Maclean, 'Brit. Med. Journ.,' 1867, Feb., 161; Myers, ib., 1869, April, 331; and 'On the Etiology and Prevalence of Diseases of the Heart among Soldiers,' Lond., 1870; Oliver, 'Brit. Med. Journ.,' 1875, May, 699; Eames, ib., June, 765; Davy, 'Brit. Army Reports,' 1876, 245; Cullen, l. c., 1059.

⁸ Fräntzel in 'Virchow's Arch.,' 1873, lvii, 215.

effects on the respiration and circulation produced by carrying heavy weights (arms, accoutrements, knapsack), under the constriction of a tight-fitting uniform, is to be regarded as the true cause of cardiac and aortic disease being so common among soldiers, excentric hypertrophy being the most usual result.

That a continuance of intense *emotional excitement*, as causing increased action of the heart, may give rise to hypertrophy, cannot be contested *a priori*; and therefore we ought not peremptorily to reject as erroneous the statements made by a number of observers, that there has been a notable increase in the number of patients with heart-disease at times of great political or social excitement. There are observations of that kind dating from France after the great Revolution in the end of last century,¹ and after the political stir of 1830.² A striking increase of heart-disease is alleged also for the Argentine States as a result of the political confusion and civil war :

"I medici più vecchi," says Mantegazza, "assicurano di aver veduto palesemente un aumento nella citra dei cardiaci dopo le ultime guerre che oscurarono la prima pagina tanto gloriosa della storia di quel paese."

According to Parola, the same thing was observed by several Italian physicians in Rome after 1848, and in Sicily in 1860.

§ 128. GENERAL CIRCUMSTANCES OF VALVULAR DISEASE.

Endocarditis with valvular incompetency is shown, in the writings already quoted from the most various places in high and low latitudes, to be essentially bound up in its geographical distribution with *rheumatic fever*. Like that disease, it is found to a greater or lesser extent at most parts of the globe.³ It is impossible to decide, from the data, whether

¹ It should be kept in mind, however, that this was the time of Corvisart's epoch-making work on heart-disease, by which the attention of the profession was first drawn to that chapter of pathology.

² Simonin, '*Recherches topogr. et méd. sur Nancy*,' Nancy, 1854, p. 165.

³ Nachtigal ('*Sahara und Sudan*,' Berlin, 1879-81, ii, 464) points out that in Bornou, where rheumatic fever is rare, valvular disease of the heart is also rare.

certain things with a special action on the heart, such as alcoholism, syphilis, and the uric-acid diathesis (or gout), which give rise to endocardial disease in individual cases, are at work also on a large scale to make the disease more frequent in certain sections of the community. A fact mentioned by Morehead is worthy of note, that endocarditis (and valvular disease) is commonest in Bombay, according to his experience, among Parsees, rarer among Hindus and native Christians, and rarest of all among Mohammedans. He professes his inability to explain the fact; and it is questionable whether the matter be one of predisposition due to racial peculiarities.

The same circumstances that essentially determine the occurrence and frequency of endocarditis, regulate also the geographical distribution of *pericarditis*.

§ 129. GENERAL CHARACTERS OF SCORBUTIC PERICARDITIS.

Pericarditis scorbutica is a form of the malady peculiar in its origin. It has been mostly described by Russian practitioners, being met with especially often in some parts of Russia where scurvy is endemic. The earliest mention of it occurs in the account of the epidemic of scurvy among the marines at St. Petersburg in 1831-34.¹ Subsequent notices of it relate to the epidemic of scurvy at Cronstadt² in 1839; there is an account of it at Moscow the same year,³ and it is mentioned as having been observed during the epidemic of scurvy at Sebastopol in 1849.⁴ To nearly the same time belongs a full account of the scorbutic pericarditis by Kyber.⁵ During the last twenty years there have been no

¹ Seidlitz, who described it in Hecker's 'Wissensch. Annal. der ges. Heilkde.' xxxii, 129, thought that he recognised in this disease the "morbus cardiacus" of ancient writers; but that view was shown to be untenable by Landsberg in 'Janus,' ii, 53.

² Karawajew, 'Med. Ztg. Russl.,' 1840, No. 51.

³ G. Samson v. Himmelstiern, 'Beobachtungen über den Scorbut, &c.,' Berl. 1843, and W. Samson v. Himmelstiern in Häser's 'Archiv für die ges. Med.' v, 542.

⁴ Heinrich, 'Med. Ztg. Russl.,' 1849, 169.

⁵ Ib., 1847, Nr. 20, ff.

writings upon it, a fact that is probably to be explained by the decline of scurvy itself within the same period.

Clinical characters.—The disease sometimes affected those who were already the subjects of marked scorbutic sickness, but sometimes also those who had no signs of it, the cardiac malady being in them the first and not unfrequently the only expression of the scorbutic dyscrasia. Besides the well-known physical signs of a pericarditis with more or less extensive hæmorrhagic effusion into the sac, the characteristic phenomena of the disease were a fainting sensation, painful tension in the præcordium, a small and compressible pulse, lividity and coldness of the extremities, tongue, and point of the nose (if the effusion were considerable), distension of the jugular veins, dilatation of the pupil, and great anxiety. These were either seen at once, within the first twelve or twenty-four hours, or they developed more gradually in the course of several days, and as a sequel to various scorbutic and rheumatic troubles of longer or shorter duration.

Morbid anatomy.—Examination after death showed a more or less copious hæmorrhagic exudation into the pericardial sac; sometimes the distension was so considerable that the pericardium came close to the left thoracic wall, while it extended in the other dimensions as well, compressing more particularly the lower lobes of the lung, and in that way occupying a great part of the thoracic space both on the left side and on the right. The exudation was either a coagulum of a deep red colour, soft, and containing an abundance of serum, or it was fluid serum, stained more or less deeply. The visceral pericardium was usually covered with a layer of coagulated fibrin in various shapes and patterns and loosely adherent; underneath it the surface of the heart was unaltered and free from inflammatory redness, with an appearance of violet, or yellowish brown, or of a peculiar paleness. Fibrinous coagulation of the same kind was found on the outer layer of the sac, but less uniformly and smaller in quantity, protracted cases having most of it; beneath that outer layer also the colour of the tissue was normal. It often happened that the heart presented a shrunken and flabby appearance, with the ventricles empty, the endocardium stained red by imbibition. The lungs were mostly œdematous; not infrequently a hæmorrhagic effusion like that of the pericardium was found in the pleura (left side mostly), and even in the peritoneum, although more rarely. Besides these conditions there were often various other appearances proper to scurvy of the ordinary kind.

§ 130. SCORBUTIC PERICARDITIS MOSTLY A RUSSIAN MALADY.

Scorbutic pericarditis is an occasional incident in many parts of the world; but in groups of cases, or as a sort of

endemic, it would seem to have been met with only in Russia, where scurvy itself, as we have seen in the second volume, had borne an endemic character down to recent times. But Kyber goes too far in placing the seat of pericarditis scorbutica exclusively in the "coast-regions of the far north;" for the malady has been widely prevalent in Moscow and even in Sebastopol.

Seidlitz had expressed the opinion that there was a rheumatic element essentially present in the causation, besides the scorbutic diathesis; or, in other words, that the atmospheric influences which give rise to rheumatism were an etiological factor in the production of that form of pericarditis in persons already subject to the scorbutic diathesis or suffering from developed scurvy. The same view was afterwards held by Kyber, Samson von Himmelstiern and others. In support of this there is, on the one hand, the fact that most of those attacked by the disease had suffered from rheumatism at a more or less recent period; and, on the other hand, the fact that the malady was commonest in, and almost peculiar to, that time of the year which forms the season of rheumatism, namely, the months of March and April; it was in those months, as S. von Himmelstiern states, that the disease was met with in St. Petersburg and Cronstadt every year to a greater or less extent, while it was rare in summer, and rarer still at other seasons.

Lastly, it should be mentioned here that scorbutic pericarditis has been particularly common in the military service, especially in sailors and marines; and next in order, more common among the natives and residents in the Baltic provinces than among the Russians proper. The explanation of this is that they were the persons who suffered in largest numbers and most severely from scurvy, the experience of v. Himmelstiern in Moscow and of Heinrich in Sebastopol serving to prove that the malady had not spared other classes of society when the conditions led up to it.

2. *Aneurism and Atheroma.*

§ 131. DISTRIBUTION AND CIRCUMSTANCES OF ANEURISM.

For the reasons stated at the beginning of this chapter, there is no safe estimate to be got of the geographical area of chronic endarteritis and aneurism.¹ Atheroma of arteries which, as we all know, is often met with in the temperate latitudes of both hemispheres, is but very rarely mentioned in the writings from tropical and sub-tropical regions, the notices of it coming chiefly from *India*² and *Japan*.³

Treille remarks that atheromatous or aneurismal disease is of common occurrence among the Hindu population of India, a good deal of it being in early life. There is most of it, no doubt, in large cities such as Bombay and Calcutta, particularly among the working classes, and less of it in the country. He believes that the cause of it is to be found in the almost exclusive use of rice, which has the effect of introducing large quantities of mineral matters, especially phosphates, into the organism, the same dietetic usage being associated also with the frequent occurrence of calculus in India.

Since the publication of a work by Crisp,⁴ in which he stated that aneurism was nowhere so common as in *England*, the notion of the disease predominating in the Anglo-Saxon race has been accepted as a kind of belief. And, as a matter of fact, it appears to be well grounded in one respect at least—in the remarkable frequency of the disease among the British troops,⁵ not only at home but still more at foreign

¹ It is clear that hospital statistics cannot be our measure for determining this matter. If we were to use the mortality returns, we should also be led to fallacious conclusions, for the reason that many cases of aneurism in arteries within reach are cured, while many fatal cases of aneurism had not been recognised as such during life, and had been entered in the tables of deaths under other heads. Nearly all the opinions as to the frequency of aneurism in various parts of the world rest on personal impressions and not on exact tabulated experience.

² Treille, 'Annal. d'hyg.' 1878, Mars, 304.

³ Wernich, 'Geographisch-med. Studien,' &c., 173.

⁴ 'Treatise on the Structure, Diseases, and Injuries of the Blood-vessels,' Lond., 1847.

⁵ See Muscroft, 'Lancet,' 1869, May, 625; Gore, *ib.*; discussion on the subject in 'Brit. Med. Journ.,' 1869, Feb., 176; Moinet, 'Edin. Med. Journ.,' 1871, Decbr., 505.

stations such as the *Cape*¹ and *India*,² for which our information is more precise. For *Australia* also we have accounts (from Melbourne) of the relatively common occurrence of aneurism among the British colonists. We have no means of judging how far this predominance of aneurism reaches in England and her colonies, and whether it is uniformly distributed among the urban and rural populations. At all events Britain is not in an absolutely exceptional position as regards aneurism; for there are accounts of the disease being relatively frequent in other countries: such as *Italy* (where Lippich³ speaks of aneurisms as being "admodum frequentes" in Padua), *Turkey*,⁴ *India* (where Treille, as we have seen, found aneurism as well as atheroma common among the Hindus), *China* (mostly in Europeans, more rarely among the natives),⁵ *Japan*,⁶ *United States* (particularly San Francisco, where aneurisms are much more common than in London⁷), *Brazil*,⁸ and *Chili* (one of the principal seats of serious circulatory disorders).⁹ The disease is said to be absolutely rare in *Egypt*¹⁰ and in the French Antilles (*Martinique*).¹¹ There is nothing whatever said of the occurrence of aneurisms in *negro* countries.

Scanty as these data are concerning the geographical distribution of aneurism, we may conclude with some measure of certainty from them, that the disease is quite independent of *climatic* influences. There is equally little reason to suppose that *racial peculiarities* have any etiological significance for the greater or less prevalence of the condition. Apart

¹ Lawson, 'Brit. Army Reports for the year 1866,' 548; Fritsch, 'Arch. für Anat. und Physiol.,' 1867, 733.

² Ranking, 'Madr. Quart. Med. Journ.,' 1863, July, 62; Morehead, 'Clinical Researches, &c.,' ii, 421; Hunter, 'Transact. of the Bombay Med. Soc.,' n. s., i, 239; ii, 222, v, 47.

³ 'Annal. scholae clin. Patav.,' Fasc. i, Patav., 1837, 11.

⁴ Rigler, 'Die Türkei und deren Bewohner, &c.,' Wien, 1850, 253.

⁵ Rochefort, 'Arch. de méd. nav.,' 1873, Avril, 241.

⁶ Wernich, l. c.; Scriba, 'Zeitschr. für Chirurgie,' 1885, xxii, 513.

⁷ Soule, 'Pacific Med. Journ.,' 1867, i, 9, 1868, ii, 213; Gibbons, *lib.*, i, 52 Bourse, 'Arch. de méd. nav.,' 1876, Juin, 454.

⁸ Varnhagen, 'Hamb. Magazin für Heilkde.,' iv, 368; Sigaud, 'Du climat et des maladies du Brésil,' 306.

⁹ Lafargue, 'Bulet. de l'Acad. de méd.,' 1851, 189.

¹⁰ Pruner, Griesinger, ll. cc.

¹¹ Ruz, 'Arch. de méd. nav.,' 1869, Octbr.

from syphilis and gout, which are well known to be in very close causal relation to atheroma of arteries and to the aneurismal dilatations springing out of the latter, but can only account for sporadic cases, perhaps the most probable cause that can be conjectured for the greater or less amount of aneurism in a population would be certain *circumstances in their mode of life*; and, where it is a question of the lesion on a large scale, they would consist more particularly in *muscular strain* or other things of a *traumatic* kind (pressure, shock, breakage) incidental to the sort of occupation, inasmuch as these would tell upon the walls of the arteries and become the causative factor in the chronic endarteritis and aneurism developed therefrom, or they would lead to the direct production of an aneurism. In this way we should explain, as a negative fact, the rarity of the disease in the female sex; and, as a positive fact, the prevalence of it among those of the working class who are most exposed to the injuries in question, such as soldiers, sailors and dock labourers, who make up, according to the San Francisco observation, the large total of patients with aneurism in that city. It may be well to note here the remark of Soule and Lidell,¹ that the majority of cases in the United States are not among those born in the country, but among immigrants, who are the class obliged to accept the hardest bodily tasks for a livelihood.

In San Francisco, according to Soule, the ratio of aneurisms among free-born Americans and immigrants was as 1 to 4. Of 242 fatal cases in New York during nine years, there were, according to Lidell, 81 in persons born in the States and 161 in immigrants.

Some observers lay special stress for the etiology upon the immoderate addiction to *alcoholic drink*. This opinion, which rests mostly upon English experience, is not in accordance with the facts stated for Sweden by Magnus Huss, the well-known author of one of the best works on alcoholism, in a private letter to Lebert:² although brandy-drinking in that country used to be carried to enormous excess,

¹ 'Amer. Journ. of Med. Sc.,' 1867, Jan., p. 48.

² Published by him in his chapter on "Diseases of the Arteries" in 'Virchow's Handb. der Pathol. und Therapie,' Bd. v, 2te Abtheil.; 2te Aufl., 379.

"aneurism is a rare disease, and where it occurs, it has no definite connexion with the abuse of brandy."

Hæmorrhoids.

§ 132. WELL-KNOWN IN ANTIQUITY; STAHL'S 'DOCTRINE OF THE GOLDEN VEIN'; GEOGRAPHICAL DISTRIBUTION OF PILES.

Among the diseases of the vascular system that are most frequent and most widely diffused, hæmorrhoids take a leading place. That is true not merely for the present and the immediate past, but it can be proved for all times far back into antiquity. Stahl,¹ in his 'Doctrine of the Golden Vein,' wrote:

"Si quid usquam aliud in historia medica practica minus quam conveniebat in animum admissum est, quod tamen insuper haberi minime omnium debuerat, est illud profecto hoc, de quo loqui aggredimur, hæmorrhoidalis evacuationis negotium;"

But that was an estimate that could only be approved from the theoretical stand-point which he assumed in his handling of the question. Not only in the writings immediately before Stahl's time, but also in the ancient and mediæval treatises on medicine, we find incontrovertible evidence of the great and excessive importance attached to hæmorrhoidal escape of blood, the same having been at all times an exceedingly common aim of medical practice.

In the medical writings of antiquity, including the Hippocratic Collection,² the compendiums of Celsus,³ and Aretæus,⁴ and the works of Galen,⁵ Oribasius,⁶ Aëtius⁷ and Paulus,⁸

¹ 'Theoria med. vera,' sect. ii, part. ii, "De Hæmorrhagiis," Articulus iv, Halæ, 1707, p. 159.

² 'Prænot. Coac.,' § 346, ed. Foës, Genev., 1657, 173; 'Aphor.,' sect. iii, § 30, edit. cit., 1248; 'Lib. de Hæmorrhoidibus,' ed. cit., 891.

³ 'Medicinus,' lib. vi, cap. 18, § 9, ed. Targa, Argentorati, 1806, 363.

⁴ 'De causis et signis diut. morb.,' lib. i, cap. 3, 5, ed. Kühn, 121, 302, 319.

⁵ 'Lib. de atra bile,' cap. 4, ed. Kühn, v, 117; 'De sanitate tuenda,' lib. v, cap. 12, ed. cit., vi, 375; 'Method. medendi,' lib. vii, cap. 11, ed. cit., x, 512; 'De venæ sectione adversus Erasistratum,' cap. 5, ed. cit., xi, 166; in 'Hipp. libr. de hæmorrhoid. comment.,' iii, § 26, ed. cit., xvi, 453; in 'Hipp. Epid.,' lib. vi, comment. v, § 25, ed. cit., xvii, 13, 286.

⁶ 'Synopsis,' lib. ix, cap. 18, ed. Stephano, 141.

⁷ 'Tetrab.,' Sermo, i, cap. 49, 'Tetrab.,' iv, Sermo, ii, c. 5; ed. Stephano, 198, 688.

⁸ 'De re medica,' lib. iii, cap. 59, ed. Torino, Basil, 1551, 271.

piles are not only described in fullest detail from the anatomical and pathological point of view, but the loss of blood from them is dwelt upon as highly important for the general health of the individual. The kind of depuratory office assigned to them is the same that came in after times to be one of the most extravagant of medical doctrines, following the alternations of humoral and solidist teaching.

"Haemorrhoides," we read in Galen,¹ "fiunt ab atra bile, quae ad venas sedis uberius cumulatiusque decumbit; quocirca quum melancholicis et vitio renum laborantibus superveniunt, curare eas solent, quod non solum ratione evacuationis, sed etiam humoris, qui evacuatur, qualitate faciunt; effundere enim crassum sanguinem humoris melancholici plenum solent, qualem nos fecem in vino apellamus. Itaque quum haemorrhoides veluti fecem sanguinis evacuent, merito fit, ut . . . qui soliti sunt per eam partem evacuari, si totam excretionem cohibere velint atque ita, ut ne una quidem haemorrhoids aperta servetur, periculum subeant, ne postea multos insanabilesque morbos, praesertim vero aquam inter cutem et tabem patiantur . . . Perspicuum autem est aquam inter cutem frustrata sanguinis procreatione effici; propter eandem vero cohibitionem tabes fit, quum jecur plenitudinem in venas pulmonis protrudit et vasculum in ibi ruptum est; his porro morbis homines liberantur, si haemorrhoides superveniant aut etiam si una adaperita sit conservata." "Plerisque haemorrhoides vacuare superflua consueverunt," he says in another place;² and in like manner Aretaeus gives "suppressio haemorrhoidum profluvii," as a frequent cause of "cachexia" or of the "mali corporis habitus." "Tertium ani vitium," says Celsus, "est ora venarum tamquam capitulis quibusdam turgentia, quae saepe sanguinem fundunt; αἱμορροΐδας Graeci vocant. Atque in quibusdam parum tuto supprimitur, qui sanguinis profluvio imbecilliores non fiunt; habent enim purgationem hanc, non morbum. Ideoque curati quidam, cum sanguis exitum non haberet, inclinata in praecordia ac viscera materia, subitis et gravissimis morbis correpti sunt." Aëtius, Oribasius, and other medical writers of antiquity, express a similar opinion.

We meet with the same conception and representation of the malady, often given at great length, in the writings of the Arabians, such as Serapion,³ Rhazes,⁴ Haly Abbas,⁵

¹ In "Comment. in Hipp. lib. de haemorrhoid.," l. c.

² "Method. med.," l. c.

³ "Pract. tract.," iii, cap. 28, Lugd., 1525, 50.

⁴ "De re medica," lib. ix, cap. 80, and "Divisionum," lib. i, cap. 96, Basil, 1554 265, 407.

⁵ "Liber theoricæ," ix, cap. 29, "Liber practicae," vii, cap. 24, Basil, 1523, 115b, 247b.

Avicenna,¹ Abulcasim² and Avenzoar;³ as well as in mediæval compilers generally, such as Constantinus Africanus,⁴ Platearius,⁵ Rolandus,⁶ Arnaldus Villanovanus,⁷ Actuarius,⁸ Valescus of Tharanta,⁹ Savonarola,¹⁰ Clementius,¹¹ Gatinarius,¹² and Varignana;¹³ also in such writers of the sixteenth and seventeenth centuries as Hollerius, who says: "*Hæmorrhoides universum corpus evacuant, idque aliquando cacothymia, aliquando puro sanguine, quique sola quantitate peccat.*"

These facts should suffice to prove how little justification Stahl had in speaking as he has done in the passage above quoted; they show us how much attention had been given to this disease by the practitioners of all times, how well they had estimated its importance in the economy of the body, and in fact over-estimated it, and how universal a disease bleeding piles must have been in every age. The enormous number of observations collected about piles from the latter part of the seventeenth century and throughout the eighteenth, as well as the intensified interest of the medical profession in the subject during the same period, and the abundant testimony that the disease occurred on the large scale—all this was owing, not to any real increase of the disease as compared with former periods, but solely to the fact that theoretical speculation was bringing the hæmorrhoidal flux into wider and wider relation with all sorts of diseased processes. The conception of what was hæmorrhoidal disease became, therefore, larger and larger, its extensions being after the most arbitrary fashion; until

¹ 'Canon,' lib. iii, Fen. xvii, tract. i, cap. 2, Venet., 1564, i, 844.

² 'Method. med.,' lib. i, cap. 35; lib. ii, cap. 81, Basil., 1541, 28, 135.

³ 'Theisir,' lib. ii, tract. i, cap. 6, Venet., 1490, 23b.

⁴ 'De morb. cogn. et curat.,' lib. iv, cap. 19, Basil., 1536, 89.

⁵ 'Practica de egritud. intest.,' cap. 7, Lugd., 1525, 257b.

⁶ 'Medendi ratio,' lib. iii, cap. 45.

⁷ 'Regim. Sanitatis,' cap. 19, Opp. Basil., 1585, 808.

⁸ 'Method. med.,' lib. i, cap. 20.

⁹ 'Philonium,' lib. iv, cap. 31, Lugd., 1490, 199.

¹⁰ 'Practica,' tract vi, cap. xvii, rubr. ii, ff, Venet., 1497, 207.

¹¹ 'Lucubrat. de febr. cognit.,' Basil., 1535, 40, 45, 'De fluxuum cognit.,' ed. cit., 106.

¹² 'De curis egritud. particul.,' Lugd., 1525, 53b.

¹³ 'Secreta subl. ad var. curand. morb.,' Lugd., 1526, 54b.

at length there arose a phantom of "hæmorrhoidal disease," which has only been exorcised by the recent anatomical methods of pathology. Therein, however, we have fallen from one extreme into another. Trusting to the experience of the deadhouse, or to casual observations, we have come to deny all elements of general malady whatsoever in the hæmorrhoidal process, and to recognise in it nothing but a purely local disease—a view of the matter that has been contested by Lebert with arguments of the most cogent kind.¹

If we may conclude from the writings of former times that the hæmorrhoidal disease has been uniformly common in all periods; we may with no less certainty infer from them that the *geographical area* of it had extended to every circle of professional practice in those times both in Europe and the East. That area of distribution will appear to have increased in recent times in proportion to the number of references to the malady that reach us from many remote parts of the world; whereby the ubiquitous character of the disease is placed beyond doubt.

Evidence of the commonness of the condition comes from all parts of *Russia*,² from the *Scandinavian*³ kingdoms, *England* and *Scotland*,⁴ *Germany*, the *Netherlands*, *France*, *Italy*⁵ (especially the Tuscan Maremma, the southern provinces of the peninsula, and Sicily⁶), from *Hungary*,⁷ *Roumania*⁸ and *Turkey*⁹ (where piles are so common that, as Beyran puts it, "elles sont devenues en quelque sort une

¹ Virchow's 'Handbuch der speciel. Pathol.' v, 2te Abtheil, 107.

² Attenhofer, 'Med. Topogr. der Hauptstadt St. Petersburg,' Zürich, 1817, 221, and Lichtenstädt in Hecker's 'Wissensch. Annal. d. Hlkde.,' 1834, xxx, 76 (Petersburg); Scholvin, 'Med. Ztg. Russl.,' 1848, 331 (Jaroslav); Herrmann, ib., 1845, 187 (Astrakhan); Erdmann, 'Med. Topogr. des Gouvernements und der Stadt Kasan,' Riga, 1822, 154, 252; Ucke, 'Das Klima und die Stadt Samara,' Berlin, 1863, 208.

³ Otto, 'Transact. of the Prov. Med. Assoc.,' vii, 207 (Denmark).

⁴ Autenrieth, 'Unters. über die Volkskr. in Grossbritannien,' Tübing., 1823, 115.

⁵ Parola, 'Saggio di climatol. e di geogr. nosol. dell' Italia,' Torino, 1881, 741; de Renzi, 'Topogr. e statistica med. della città di Napoli, &c.,' Nap., 1845, 324.

⁶ Ziermann, 'Ueber die vorherrsch. Krankh. Siciliens,' Hannov., 1819, 208; Vivenot, 'Palermo und seine Bedeutung als Heilungsort,' Erlang., 1860.

⁷ Jancovich, 'Pesth und Ofen mit ihren Einwohnern,' Ofen, 1838, 192.

⁸ Schmalz, 'Deutsche Klin.,' 1852, Nr. 39.

⁹ Oppenheim, 'Ueber den Zustand der Hlkde. in der Türkei,' Hamb., 1838, 65; Rigler, 'Die Türkei, &c.,' ii, 263; Beyran, 'Gaz. méd. de Paris,' 1854, 342.

fonction physiologique"), from *Greece*¹ and the *Ionian Islands*.²

Coming to Asia, we have information of the same kind for *Syria*,³ *Arabia* and *Persia* (particularly the shores of the Persian Gulf⁴), for *India*⁵ and for the *East Indies*.⁶ Among African countries the disease is reported from *Egypt*,⁷ *Abyssinia*, the *Zanzibar*⁸ coast, *Tunis*,⁹ *Algiers*,¹⁰ and the *Cape*.¹¹ In the Western Hemisphere we hear of it from *Alaska*,¹² all parts of the *United States*, *Brazil*,¹³ *Bolivia* (special mention of Santa Cruz de la Sierra¹⁴), *Chili*,¹⁵ and the littoral and forest-region of *Peru*.¹⁶

The exemption that the negroes in their native countries appear to enjoy, is noteworthy. We find it positively stated as regards Nubia;¹⁷ and the condition is very rare among the negroes in Egypt.¹⁸ Again, there is not a word said of piles in the writings upon the diseases of the natives on the West Coast of Africa. It would appear to be quite unknown, also, among the Indians inhabiting the sierra-region of Peru.¹

¹ Olympos, 'Bayer. med. Correspdzbl.,' 1840, i, 184.

² Hennen, 'Sketches of the Med. Topogr. of the Mediterranean, &c.,' Lond., 1830, 276.

³ Post, 'New York Med. Rec.,' 1868, Jan., 149.

⁴ Palgrave, 'Union méd.,' 1866, 308.

⁵ McGregor, 'Pract. Observ. on the Principal Diseases . . . in the North-Western Provinces of India,' Calcutta, 1843, 169.

⁶ Heymann, 'Darstellung der Krankh. in den Tropenländern,' Würzb., 1835-84; van Leent, 'Arch. de méd. nav.,' 1867, Sept., Sollaud, ib., 1882, Sept., 166 (Manilla).

⁷ Pruner, 'Krankh. des Orients,' 292.

⁸ Burton, 'Zanzibar, its City, Island, and Coast,' Lond., 1872.

⁹ Ferrini, 'Saggio sul clima e sulla precipue malattie della città di Tunisi e del regno,' Milano, 1860, 165.

¹⁰ Schönberg, 'Skizzen über Algier in med. Rücksicht.,' Kopenh., 1837, 34.

Bertherand, 'Médecine et hygiène des Arabes,' Par., 1855.

¹¹ Scherzer, 'Zeitschr. der Wiener Aerzte,' 1858, 165; Fritsch, 'Arch. für Anat. und Physiol.,' 1867, l. c.

¹² Blaschke, 'Topogr. med. portus Novi-Archangelcensis,' Petropoli, 1842, 66.

¹³ Martius, 'Repertor. der Pharmacie,' xxxiv, 149; Sigaud, 'Du climat et des malad. du Brésil,' Par., 1844, 163.

¹⁴ Bach, 'Zeitschr. f. Erdkunde,' iii, 543.

¹⁵ Piderit, 'Deutsche Klinik,' 1853, Nr. 48.

¹⁶ Tschudi, 'Oest. med. Wochenschr.,' 1846, 473, 698, 731.

¹⁷ Brocchi, 'Giornale,' v. 599.

¹⁸ Pruner, l. c.

¹⁹ Tschudi, l. c.

§ 133. REASON OF PILES BEING COMMON IN THE TROPICS; THE IMMUNITY OF THE NEGROES.

Justified, then, as we are in designating hæmorrhoids as an ubiquitous malady, we must at the same time admit that it is especially common in many regions within lower latitudes, particularly in the tropics. Thus we learn from the authorities for the East Indies, such as v. Leent and Sollaud, that few Europeans who have lived there a considerable time escape it. In Turkey, Syria, Egypt, Tunis, Algiers and other countries inhabited by Mohammedans, it has the character of a truly endemic malady, especially among the proprietary class; and there is information to the same effect from certain tropical regions of South America. That the cause of this is not any direct action of *climatic conditions* is obvious; and the attempts to explain the fact by the "relaxing effects of the hot climate," by the "exaggerated venosity" thereby caused, or by other hypotheses of a like kind, are futile, inasmuch as they have no physiological basis.

There is no question, however, that this form of venous dilatation is due to hyperæmic obstruction within the sphere of the hæmorrhoidal plexus, an obstruction that depends on impediments to the circulation in that section of the venous system, or on diminished or hampered reflux of blood from the hæmorrhoidal veins into the collecting branches of the portal vein or inferior vena cava. The reason of these impediments may be either congestive hyperæmia in those great venous trunks, or pressure within the hæmorrhoidal vessels themselves, or lowering of the *vis à tergo* by which the blood is driven from that plexus into the larger vessels. Accordingly we shall look for the occasion of hæmorrhoidal dilatation either in morbid conditions of the individual somewhere else, or in certain injurious *habits of living* from which impediments to the venous reflux may arise on the one side or the other. In those regions, or among those populations or sections of a population, where one or more of these etiological factors make themselves felt on a large scale, the malady will be particularly common; and, from that point

of view, it is not difficult to find an explanation of piles being frequent at some parts of the world, tropical and sub-tropical more especially, in certain morbid conditions generally prevalent and due to the climate, or in hygienic errors having their root in the manner of life.

In respect to the morbid conditions of general prevalence, we have first of all to keep in view the endemic hyperæmia of the liver in low latitudes ; it is felt most by the Europeans resident in those countries, and as we have seen (p. 405-10), it is due in part to the climatic influences, and in part favoured by an ill-adapted nutrition, by the inordinate use of very substantial food, and by the abuse of alcoholic drinks, spices, coffee and the like. With regard to the second element in the causation (the habits of life), that is the factor which, according to many observers, specially conduces to the malady among Orientals and among the inhabitants of several tropical regions of South America, associated with it being sedentary habits and the serious effects of these on the circulation within the pelvic organs. This two-fold view of the causes of the preponderance of the malady in those parts of the world finds additional support in the fact that, in them even more than elsewhere, it is the better-off classes of society, principally exposed as they are to such errors in their manner of life, that are far more frequently subject to the disease than the lower ranks with their sober living and activity of body.

But the problem of the causes of piles is by no means solved by adducing these factors in it. A certain constitutional tendency is undoubtedly a not unimportant predisposing element in the pathogenesis, an element that comes out unmistakeably in the *heredity of piles*, which was long ago ascertained by Montuus, Hollerius and other of the older writers, and has been confirmed by many of the more recent. It is most probable that this predisposition depends on a feeble development of the walls of the veins, whereby their tone or elasticity is reduced, dilatation of the lumen of the vessel ensuing the more easily from a state of hyperæmia. That fact, assuming it to be correct, may perhaps be brought into relation with the peculiarities of certain *races* as regards venous dilatation in general, and piles in parti-



cular—I mean the exemption which, according to several observers, the *negroes* enjoy from hæmorrhoids, as well as the rarity of varicose veins of the lower extremities in the same race (see Chassaniol, ‘Arch. de méd. nav.’ 1865, May, p. 510), the reason of both being the unusual strength of the walls of their blood-vessels.

CHAPTER XV.

CALCULUS AND OTHER URINARY DISORDERS.

§ 134. GEOGRAPHICAL DISTRIBUTION OF BRIGHT'S DISEASE.

Diseases of the urinary organs are another group for which the statistical returns and local information are too scanty and of too questionable value to enable us to form an estimate of them from the geographical point of view. I must confine myself, therefore, to certain kinds of urinary diseases; and there is only one of them—calculus—for which I can find something more than meagre notices.

With reference to kidney diseases in general, we may conclude from what has been written on the subject that they are less frequently met with in equatorial and sub-tropical countries than in higher latitudes, and accordingly that circumstances of climate exert an unmistakeable influence on their geographical distribution. This holds good more especially for *Bright's disease*. Although it is not altogether absent from any part of the world, as we may learn from the experience of temperate latitudes in either hemisphere, as well as from the writings relating to countries in the South of Europe, such as *Turkey*¹ and *Greece*,² and to *India*,³ *China*,⁴ *Japan*,⁵ *New Zealand*⁶, *Egypt*,⁷ the

¹ Rigler, 'Die Türkei und deren Bewohner,' ii, 317.

² Stephanos, 'La Grèce, &c.,' Par., 1884, 547.

³ Morehead, 'Clinical Researches on Disease in India,' Lond., 1856, ii, 200; Webb, 'Pathologia indica,' Lond., 1849, 207; Eyre, 'Madras Quart. Journ. Med. Sc.,' 1860, Oct., 342; Day, ib., 1862, Jan., 35; Ranking, ib., 1863, Jan., 1.

⁴ Hobson, 'Med. Times and Gaz.,' 1860, Decr., 633; Smart, 'Transact. Epidemiol. Soc.,' 1862, i, 223; Dudgeon, 'Glasgow Med. Journ.,' 1872, Jan., 1.

⁵ Albrecht, 'Petersb. med. Ztschr.,' 1862, iii, 50; Wernick, 'Studien,' 173.

⁶ Thomson, 'Brit. and Foreign Med.-Chir. Rev.,' 1854, (

⁷ Pruner, 'Krankh. des Orients,' 266.

Cape,¹ Mexico,² Costa Rica,³ the West Indies,⁴ Guiana⁵ and Brazil;⁶ yet, within the higher latitudes, it is most commonly seen, according to the data of Rayer,⁷ Copland,⁸ G. Johnson⁹ and others, in those regions with a climate subject to chilling damp and to sudden changes; and in such localities its type also would appear to be more pernicious than under the converse circumstances.

The rarity of the disease in Hong Kong comes out in Smart's hospital report, according to which there were only seven cases of kidney disease among 4738 patients treated at the Marine Hospital during a space of two years. The same fact is asserted by Wong from his observations in Canton, and by Dudgeon from his Pekin experience. For Japan, Wernich says that renal disease of every kind is rare, Bright's disease more especially. That has also been the experience of Egan at the Cape, of Pruner in Egypt, of Schwalbe in Costa Rica, and of Dundas in Bahia. During six years' practice at Vera Cruz, Heinemann saw only half a dozen cases of Bright's disease, and of these four recovered. Blair says that it is rarely seen in British Guiana, and adds that "morbus Brightii, when it occurs, is a curable symptom." In New Caledonia, according to Boyer, not a single case of it had occurred in the hospitals of the colony; and Thomson makes a similar statement for New Zealand.

There are many exceptions, however, to this rule. Against the Bengal experiences of Webb, who saw very few cases of Bright's disease during a long period when he was pathologist in the Calcutta Medical College, and who is of opinion that the disease is rare in India; against the experience of Eyre also, who found only one case of albuminuria among 8131 patients treated during five years in the Civil Hospital of Bellary (on the table-land of Hindostan, 1500 feet above the sea-level); we have the statement of Day that the malady

¹ Egan, 'Med. Times and Gaz.,' 1877, Aug., 175.

² Heinemann in 'Virchow's Arch.,' 1867, xxxix, 613, and 1873, lviii, 182.

³ Schwalbe, 'Arch. für klin. Med.,' 1875, xv, 340.

⁴ Ruz, 'Arch. de méd. nav.,' 1869, Oct., 273; Jackson, 'Boston Med. and Surg. Journ.,' 1867, July, 448.

⁵ Blair, 'Account of the Last Yellow Fever Epidemic in Guiana,' Lond., 1850, 21.

⁶ Dundas, 'Sketches of Brazil,' Lond., 1852, 60.

⁷ 'Traité des maladies des Reins,' Paris, 1839-41 (Germ. ed., Erlangen, 1844, pp. 253, 255).

⁸ 'Dictionary of Practical Medicine,' iv (German ed., p. 463).

⁹ 'On the Diseases of the Kidney,' Lond., 1852 (German ed., Quedlinb., 1854, p. 93).

is "very common" in Cochin (Malabar Coast), while Morehead, whose observations relate to Bombay, tells us that he had seen as much of it there as in the temperate latitudes of Europe. Ruzs saw very few cases of Bright's disease in Martinique; but, according to Jackson, it is common in Barbadoes. It is clear that contradictions such as these can only be explained on the supposition that influences of locality make a considerable difference within the tropics as well as elsewhere. As regards the disease in Arctic countries, I know of only two notices; and these are likewise contradictory. Panum¹ assures us that he did not meet with a single case of it among a large number of patients in the Farøe Islands; while, in Finsen's² experience, it is almost as common in Iceland as it is in Denmark.

It is worthy of note for the pathogenesis that, where the authorities in the tropics do make reference at all to the cause of the disease, they assign severe *chill* as a real occasion of it. It is only in a few cases that a connexion between renal disease and *malarial disease* is mentioned, the intense centres of malaria, such as Lower Bengal, the coast of China, Guiana and the like being precisely the regions least affected with kidney disease; so that malarious influences would appear to have very little to do with the production of Bright's disease.

§ 135. INSTANCES OF ATROPHY OF THE KIDNEYS IN THE TROPICS.

Dundas³ in discussing the correlation between the action of the kidneys and of the skin, or, in other words, the notable decrease in the amount of urine secreted in the tropics and the increase in the secretion of sweat, calls attention to a sort of atrophy of the kidneys due to acclimatisation, observed by him in Europeans who had spent from sixteen to nineteen years in Brazil. He would associate it with the diminished activity of the organ. In none of the

¹ 'Bibl. for Læger,' 1847, i, 311.

² 'Jagttagelser angaaende Sygdomsforholdene i Island,' Kjöbenh., 1874, 111.

³ L. c., p. 54.

cases that came under his observation had any symptoms referable to the kidneys been detected during life; the patients died of diseases that had nothing to do with the urinary organs. In every case the anatomical examination showed the cortex of the kidney to be paler than usual, and at the same time atrophied in the more pronounced cases, while the tubular substance came out more distinctly and was of a strikingly dark colour; also the mucous membrane covering the pelvis and papillæ of the organ was in most cases injected. On comparing the kidneys from three of these cases with the same organs from three Europeans who did not exhibit the renal atrophy but were in no wise different from the other patients as regards age, size of body, kind and duration of the fatal illness, or degree of emaciation, it was found that they weighed in the former 191, 235 and 286 grains respectively less than in the latter. Dundas has never seen that kind of change of the kidney in the natives of Brazil.

This statement, so far as I know, has hitherto attracted no notice; at least I have looked in vain in the writings upon the morbid conditions of Europeans in tropical countries for any confirmation or refutation of these observations. It is true that other English practitioners had previously called attention to the fact that those who returned in enfeebled health after a considerable residence in the tropics were apt to have a scanty secretion of urine, very concentrated and rich in uric acid and urates. Rayer¹ also has confirmed this fact in the case of several persons who had lived some time in equatorial countries. By referring here to the observations of Dundas, I may perhaps help to draw the attention of practitioners in tropical regions to this important point.

¹ L. c., p. 39.

Calculus.

§ 136. GEOGRAPHICAL DISTRIBUTION OF STONE IN THE BLADDER.

The most interesting, and at the same time the most profitable for geographical inquiry, among the diseases of the urinary system is urolithiasis. Although the topographical literature of medicine reveals very considerable gaps in the information about the distribution and etiology of calculus, and although we miss in many of the inquiries upon the subject a more penetrating discussion of a number of notable points in the natural and social circumstances of the localities (often quite small spots) within which the disease is confined, a set of statistics at all complete and trustworthy being still a "pium desiderium;" yet we have enough of literary materials at our service to make it at any rate possible to elucidate some of those points in the history of the malady which are of most importance for the working out of the etiological problem.

In the *geographical area* of calculus the continent of *Asia* takes the first place both as regards the wide diffusion of the malady and the large number of cases. In *Asia Minor*, particularly in Smyrna, it is met with frequently;¹ and that holds in an even higher degree for *Syria*, whence we have accounts of the prevalence of the disease in Beyrout, Damascus, Aleppo and a number of places in the district of Dair Kamr (Lebanon).² It would appear to be not uncommon also in *Mesopotamia*; from the information collected by Civiale,³ we learn that Martin, a German surgeon in Bagdad, had twelve operations for stone in two years (1827-28), besides seeing a great many other patients in that city

¹ McCraith, 'Med. Times and Gaz.,' 1864, July 9th, 1866, April, 387, 1872, July, 33, 1876, Aug., 221; West, 'New York Med. Record,' 1869, April, 73.

² Pruner, 'Krankh. des Orients,' 270; Brocchi, 'Giornale,' iii, 360; Robertson, 'Edinb. Med. and Surg. Journ.,' 1843, April, 247; Post, 'New York Med. Record,' 1868, June, 150, 1877, July, 469, 1880, Oct., 477; Baret, 'Arch. de méd. nav.,' 1878, Août, 87.

³ 'Traité de l'affection calculuse,' Par., 1838, 641.

suffering from calculus, and still more of them in Mosul. Confirming the writings of Arabian physicians of the middle ages as to the frequency of stone in Nearer Asia, we find accounts of recent date asserting its endemic occurrence in many parts of *Arabia* (such as the high country of Taif to the east of Mecca¹) and of *Persia*.²

The distribution of the malady in Persia and adjoining regions is thus referred to by Polak: ³ "Calculus is a common trouble in Persia, especially in the provinces that were included in former times under the names of Media and Hyrcania, such as Azerbaijan, Tabriz, Hamadan, Kashin, Teheran and Koom; also at places on the Caspian, such as Talish, Gilan, Resht, Masanderan, Demavend and Shaharood-Bustain. South of Koom, in Kasan-Ispahan, Ramish and Shiraz, it is extremely rare, so far as appears from much searching on my own part and information received from the practitioners of the country. For the other eastern and south-eastern provinces I have no particular knowledge, excepting for Meshed, where my former pupil Hekim Mirza Hussein made inquiries for me, but found only one case, which he sent to Teheran for me to operate upon. I have had sporadic cases from Bagdad, Herat, Candahar, and Sekuhe in Seistan. The patients from the last-named gave me to understand that stone was common in their country. It may be that lithiasis occurs in still other regions, and that it is merely the difficulty of communication and ignorance of the fact that an operation can effect a cure, which prevents more cases from distant parts presenting themselves."

From the foregoing it appears that stone is common in several parts of *Afghanistan*, and we have other information of it in *Cabul*,⁴ in the basin of the Oxus, and in *Khiva*.⁵ But the chief seat of the malady on Asiatic soil is *India*, although it is not so very long ago that that country had the reputation of enjoying a special exemption from calculus.⁶ The very large number of writings⁷ on the subject from India

¹ Pruner, l. c., 270.

² Polak, 'Wien. med. Wochenschr.,' 1855, Nr. 17, and 'Ztschr. der Wiener Aerzte,' 1860, 661; Tholozan, 'Union méd.,' 1861, 302.

³ 'Zeitschr. der Wien. Aerzte,' 1860, p. 661.

⁴ Curran, 'Dublin Quart. Journ. of Med. Sc.,' 1871, vol. li, 314.

⁵ West, 'New York Med. Record,' 1871, July, 223.

⁶ Scott, 'Journ. of Science and Arts,' 1816, i.

⁷ Asher, 'Transact. of the Bombay Med. Soc.,' 1862, n. s., vii, 284; Bainbridge, 'Brit. Med. Journ.,' 1876, Sept., 393; Balfour, 'Edinb. Med. Journ.,' 1860, March, 873; Bell, 'Transact. of the Calcutta Med. Soc.,' 1833, vi, 454; Brett, ib., 1831, v, 260, and 1833, vi, 443; Burnard, ib., v, 249, vi, 450, vii, 402, viii, App. xxv; Carter, 'Transact. of the Bombay Med. Sc.,' 1859, n. s., v, and 'St.

serve to show that there is hardly any part of it altogether exempt, while the malady is commonest in the northernmost districts, such as the Terai, Gorackpore, Oudh, Kumaon and the North-Western Provinces generally—"In the N.W. Provinces," says Balfour, "you might build walls with the calculi"—in the Punjaub, in Sind, in the Rajpootana States, in Gujerât, Kandeish and other parts of the Bombay Presidency; also in some parts of Central India, where it is on the whole more frequent, according to Curran, in the elevated regions than on the plains, having sometimes the character of a truly endemic disease; equally extensive in Orissa, but much less frequent in Lower Bengal, and rarest of all, it would seem, on the east and west coasts of the Madras Presidency. From the *East Indies* I know of only one reference¹ to the frequent occurrence of stone—among the natives of the Lampong territories in Sumatra; and there is a solitary reference to the same effect from *Lower India*, relating to Bangkok.² In *China* it would appear to be confined as a properly endemic disease to the province of Canton; at all events Kerr says:³

"It is a remarkable fact that urinary calculus has not been met with in any other part of China than Canton Province. Dr. Lockhart, of Shanghai, and Dr. McCartee, of Ningpo, who have practised among the Chinese for about twenty years, have informed me that they have never met with a case. That the disease exists in other parts of this vast empire is not unlikely, but it remains for future observers to discover the localities."

George's Hospital Reports, 1873, vi, 85; Cassanova, 'Transact. of the Calcutta Med. Soc.,' vi, 435; Cornish, 'Madras Quart. Journ. of Med. Sc.,' 1861, July, 89; Curran, 'Dublin Quart. Journ. of Med. Sc.,' 1871, li, 311; Darly, 'Transact. of the Calcutta Med. Soc.,' vi, 452; Durant, 'Ind. Annals of Med. Sc.,' 1860, Nov. 79; Fayer, ib., 1866, July; Finch, 'Indian Journ. of Med. Sc.,' 1834, i, 321; Greenhow, 'Indian Annals of Med. Sc.,' 1867, July, 1; Kelsall, 'Brit. Army Reports for the Year 1877,' xix, 234; McGregor, 'Transact. of the Calcutta Med. Soc.,' vi, 459; McRea, 'Indian Journ. of Med. Sc.,' 1835, ii, 42; Moorcroft, 'Travels in the Himalayan Provinces,' Lond., 1841; Morehead, 'Clinical Researches, &c.,' ii, 302; Playfair, 'Edinb. Med. Journ.,' 1864, March, 818; Shortt, 'Indian Annals of Med. Sc.,' 1858, July, 507; Twining, 'Transact. of the Calcutta Med. Soc.,' v, 273, and 'Clinical Illustr. of the More Important Diseases of Bengal,' Calcutta, 1835, i, 23.

¹ v. Leent, 'Arch. de méd. nav.,' 1877, Févr., 81.

² Stannius in Leudesdorf, 'Nachrichten über die Gesundheitsverhältnisse in verschiedenen Hafenplätzen,' 1876, Nr. 10, 25.

³ 'Amer. Journ. of Med. Sc.,' 1861, July, 99.

And therein he is in perfect accord with all writers from that country, both before and since.¹ Recent statements as to the common occurrence of the disease in Formosa (Dudgeon) and in the province of Yun-nan, still lack confirmation. In Canton and the country around, the malady is so prevalent that, as Henderson informs us, it lately became necessary to found a special hospital for stone, in which no fewer than fifty-one lithotomy operations were done in 1875.

In *Polynesia* and in *Australia* urolithiasis counts among the very rare diseases. Among the natives of *New Zealand*, as we learn from Thomson,² not a single case of it has been seen.

In African territory we meet with the most considerable centres of the malady in *Mauritius* and *Réunion*;³ also in *Egypt* and particularly in Lower Egypt, as Prosper Alpinus⁴ had formerly indicated and all subsequent authorities⁵ have confirmed; still further in *Abyssinia*⁶ (highlands of Shoa) and in *Madagascar*.⁷ In *Nubia* as well as in other negro countries of North-Eastern Africa, urolithiasis is at all events very rare; and that is the case also in the interior of Southern Africa⁸ and at the Cape,⁹ where, according to Batho,¹⁰ the disease occurs in considerable frequency at only

¹ Parker, 'Meetings of the Med. Missionary Soc. in China for 1850 and 1851,' Canton, 1852; Hobson, 'Med. Times and Gaz.,' 1860, Nov., 478; Gordon, 'Ind. Annals of Med. Sc.,' 1863, April, 430; Wong, 'Arch. de méd. nav.,' 1866, Sept., 171; Dudgeon, 'Med. Times and Gaz.,' 1876, Sept., 252, and 'Glasgow Med. Journ.,' 1877, April, 192; Henderson, 'Edinb. Med. Journ.,' 1877, Feb., 679.

² 'Brit. and For. Med.-Chir. Rev.,' l. c.

³ Civiale, l. c., 640.

⁴ 'De medicina Egyptiorum,' Lugd. Batav., 1719, 58.

⁵ Clot-Bey, 'Notes sur la fréquence des calculs vésicaux en Egypte, &c.,' Marseille, 1830, also in 'Lancette franç.,' 1831, Janv., and 'Annal. de la méd. physiol.,' 1833, Juin; Röser, 'Ueber einige Krankheiten des Orients,' Augsb., 1837, 72; Pruner, 'Krankh. des Orients,' 270; Griesinger, 'Arch. für physiol. Heilkde.,' 1854, xii, 566; Bilharz, 'Wien. med. Wochenschr.,' 1856, 67; Reyer, ib., 209; Vauvray, 'Arch. de méd. nav.,' 1873, Sept., 161; Zancarol, 'Revue de Chirurgie,' 1882, 645.

⁶ Pruner, l. c.

⁷ Vinson, 'Gaz. hebdom. de méd.,' 1866, Debr., 775; Borchgrevink, 'Norsk. Mag. for Lægevidensk.,' 1872, iii, Raekke ii, 250; Davidson, 'Edinb. Med. Journ.,' 1873, June, 1057.

⁸ Livingstone, 'Travels and Researches, &c.,' 128.

⁹ Egan, 'Med. Times and Gaz.,' 1877, August, 175.

¹⁰ 'Brit. Army Reports for the Year 1870,' xii, 502.

one point, Port Elizabeth, and there under special circumstances to be afterwards mentioned.

"Equally unknown," says Livingstone in his "Travels in Central Africa," "is the stone in the bladder and gravel. I never met with a case . . . This freedom from calculus would appear to be remarkable in the negro race, even in the United States, for seldom, indeed, have the most favoured lithotomists there ever operated on a negro."

We find a confirmation of this in the state of health of the negroes on the *West Coast of Africa*, where calculus is very rare, to say the least, and according to Daniell¹ and Clarke,² almost unknown. In the medical writings from *Senegambia* I find no reference to it; but in one account³ relating to the state of health in the district of Segu on the Niger eastwards from Senegambia it is stated: "Si nous devions toujours juger de la fréquence absolue d'une maladie d'après le nombre de cas que nous avons observés, nous pourrions dire que l'affection calculeuse des voies urinaires est une maladie commune à Ségou." This statement is the more remarkable that it stands in absolute contradiction to all the experiences that have been mentioned, or remain to be mentioned, of the extreme rarity of calculus in the negro race. In *Morocco* and *Algiers*⁴ the disease would appear (on doubtful evidence) to be somewhat common, and in *Tunis*⁵ to be seldom seen. Of *Madeira* Heineken says:⁶ "Stone is here so unfrequent that, I was told, only one instance had been known during the past forty years."

In the northern countries of Europe, including *Iceland*, *Norway*, *Sweden*, *Denmark*⁷ and the northern provinces of *Russia*, urolithiasis is reckoned among the maladies of rare occurrence.

¹ 'Sketches of the Med. Topogr. of the Gulf of Guinea,' Lond., 1849, 96.

² 'Transact. of the Epidemiol. Soc.,' 1860, i, 112.

³ Quintin, 'Extrait d'un voyage dans le Soudan,' Paris, 1869, 38.

⁴ Bertherand, 'Médecine et hygiène des Arabes,' Paris, 1855. According to Bruch ('De la maladie de pierre à Alger,' Alger, 1877), there were 26 operations for stone from 1866 to 1876 in the Mustapha Hospital of the town of Alger, 23 of these being in Europeans and 3 in natives. That would hardly indicate that the disease was common.

⁵ Ferrini, 'Saggio di clima di Tunisi, &c.,' 233.

⁶ 'Lond. Med. Repository,' 1824, July 14th.

⁷ Otto, 'Transact. of the Prov. Med. Assoc.,' vii, 207.

Civiale,¹ who has collected exact information for the first three of those countries, observes that only one case of stone in the bladder had occurred among 3200 patients in the General Hospital of Christiania during four years; and that none of the practitioners of the city, even the oldest, could recall a single case of operation for stone in private practice, cases of lithiasis having been unknown even in childhood, a time of life which is admitted to furnish a large part of all the patients with calculus. As regards Sweden, which Richerand² had already pointed to as a country little affected with stone, Civile mentions that no case of lithiasis had been admitted into the large hospital of Gothenburg since it was opened fifty years before, that only four cases had been seen in the city during fifteen years, that in other districts of Bohuslän it is hardly known, that Stockholm itself enjoyed the same kind of immunity, and that of sixty-eight practitioners in various other parts of the country only fifteen had had patients with calculus during the same period, the total number being thirty-nine. In the older medical reports from Iceland,³ mention is made of three cases of calculus during twenty years; Finsen⁴ saw only one case during ten years of practice, and is therefore disposed to conclude that the malady is at all events very rare in that country.

Of its distribution in Russia, Klien says:⁵ "There are few regions, I might almost say none, where lithiasis is more common than in the heart of European Russia. The inhabitants of the territory included in the upper basin of the Volga appear to be peculiarly subject to the malady. The parts of the empire more to the north and to the south furnish a comparatively small proportion of the patients, and in the western provinces, so far as I know, calculus is a rare thing. The hospitals of the large towns, particularly the University Cliniques of Moscow and Kasan, receive most of these cases; at certain times a fifth part of all the surgical patients in the Moscow Clinique have been stone cases, the yearly average in that hospital being rather more than sixty." This statement is fully borne out by all previous and subsequent information about calculus in various parts of the Russian Empire. From the northern provinces I find the disease spoken of as rather frequent in the accounts

¹ L. c., 580.

² "N. ——— *Chirurgicale*," Par., 1815, iii, 528.

³ *fra et lægevidensk. Synspunct.*, Kjöbenh.,

relating to Reval and the adjoining country districts of Esthonia,¹ and to the Government of Novgorod, particularly the circle of Valdai.² In Finland it is very rare, so much so that only one case has been treated in the Clinical Institute of Helsingfors during fifty years, and no practitioner in the country had had a single case in the last ten or fifteen years.³ In St. Petersburg also, the malady is so unusual that, as Attenhofer⁴ tells us, a number of the busiest practitioners of the city had not had a case amongst them during six years. The enormous prevalence of calculus in the Government of Moscow is thus referred to by Kuhl,⁵ writing in 1836: "There are few cities in Europe where the operation for stone is commoner than in Moscow; every year there are at least 125 patients operated on in the various hospitals, most of them being in the St. Marie hospital (upwards of 60), and from 40 to 50 in the Catharina hospital." To this Roos⁶ adds that 1411 cases of stone had been admitted into the St. Marie hospital in the twenty-eight years from 1808 to 1836; of that total 922 came from the Government of Moscow, 162 from Vladimir, 141 from Tver, 65 from Kaluga, 46 from Jaroslav, 25 from Orlof, all of these Governments being in the interior; while the remainder came from Tula, Smolensk and other Governments. Among the Southern provinces Transcaucasia is the only one where the malady is reported as somewhat common, particularly among the tribes of Ossetes inhabiting the mountainous regions.⁷ In the Crimea⁸ and among the Kirghiz,⁹ it is scarcely known. From the western Governments information about it is entirely wanting.

In the northern, central and western parts of *Germany*,

¹ Blum, 'Beschreibung der hauptsächlichsten in Reval herrschenden Krankheiten,' Marb., 1790, 144.

² Bardowski, 'Med. Ztg. Russl.,' 1850, Nr. 23, 179.

³ Estlander, 'Boston Med. and Surg. Journal,' 1876, Nov., 513; Beketow, 'Quelques remarques sur les calculs vésicaux et les manières de la opérer à la clinique chirurgicale de Kazan,' Paris, 1876.

⁴ L. c., 235.

⁵ In the preface to his translation (Leipzig, 1836) of 'Tanchon on Stricture of the Urethra.'

⁶ 'Württbg. med. Correspdzbl.,' 1838, viii, 331.

⁷ Reinhardt, 'Wissenschaftl. Annalen der ges. Hlkd.,' 1836, xxxiii, 437.

⁸ Heinrich, 'Med. Ztg. Russl.,' 1845, 380.

⁹ Maydell, 'Nonnulla topogr. med. Orenburgensem spect.,' Dorpat, 1849.

including the North German plain, the central plateau, the Weser districts and the countries of the Lower, Middle and Upper Rhine, stone is a disease of rare occurrence. It is only in a limited section of the Duchy of Altenburg that it has the character of an endemic malady;¹ this focus includes the environs of the town of Altenburg, and extends one league to the east, four leagues to the west (where it stops abruptly short at the slight rising-ground separating the Pleisse and Elster), two leagues to the north, and southwards as far as Zwickau or a distance of some twenty miles. In the country adjoining that spot, as in the direction of Chemnitz on the eastern side and in the circle of West Altenburg, the disease is on the whole rare; while in other directions, as towards Thuringia and the Saxon Voigtland, it hardly occurs at all; so that it is almost confined as an endemic to the Pleissethal and more particularly to that section of it which belongs to Altenburg.

In South-Western Germany there are only two considerable centres of calculus: one of them a portion of Old Bavaria, namely the region between Munich and Landshut;² the other in Upper Swabia, namely the Würtemberg circle of the Danube, including the banks of that river and the Swabian Alp (more common on the right bank than on the left, as in Ulm), the Ulmer Alp and the adjoining Iller country, as well as Langenau, Heidenheim, Blaubeuren, Geislingen and Laupheim, and lastly Sigmaringen; while the disease is rare in the circles of the Jaxt, Black Forest and Neckar.³

Of 138 operations for stone in Würtemberg, which Riedle has got knowledge of, 95 were performed in the circle of the Danube (most of these in districts near the river, such as Ehingen, Biberach, Wiblingen, Riedlingen, and Minsingen), 32 in the circle of the Black Forest (10 in

¹ Geinitz, 'Deutsche Klinik,' 1858, p. 418.

² Walther, 'Journ. für Med. und Augenhkde.,' 1820, i, 430; Textor in his translation of Boyer, 'Abhandl. über die chirurg. Krankh.,' ix, 297.

³ Riedle, 'Beitr. zur med. Statistik Württembergs,' Tüb., 1834; Rapp, 'Württemb. naturwissensch.,' Abh. i, 133, ff.; Autenrieth, l. c., 102; Majer, 'Württemb. med. Correspdzbl.,' 1836, vi, 191; Palm, ib., 192; Römer, ib.; Höring, ib., 1839, ix, 275; Camerer, ib., 1847, xvii, 57; Schmid, ib., 1869, xxxix, 193; Plieninger, 'Beschreibung von Stuttgart u. s. w.,' 116; Heyfelder in Schmidt's 'Jahrb. der Medicin,' 1839, xi, 222, and 'Studien im Gebiete der Heilwissenschaft,' Stuttg., 1839, ii, 209 (relating to Sigmaringen).

Amt Urach and 5 in Oberamt Reutlingen), 6 in the Jaxt circle and 5 in that of the Neckar. In thirty years Palm¹ performed 256 operations for stone, of which 20 were in the Oberamt of Blaubeuren, 10 in Ehingen, 13 in Geislingen, 38 in Heidenheim, 17 in Laupheim, and 59 in Ulm; the remainder being distributed over other districts including the adjoining Bavarian parishes of New Ulm, Illertissen, Roggenburg, Krumbach, and Günzburg. Of all Palm's operations, accordingly, about two-thirds occurred within a comparatively small area of the right bank and basin of the Danube, the remainder belonging to the Swabian Alp and its spurs and valleys. In correspondence therewith we find that of 107 operations done by a famous lithotomist of a former period, Zett, 92 were on the right bank of the Danube and only 15 on the left. In the principality of Sigmaringen, according to Heyfelder, 160 calculi, representing as many operations, have been collected during twenty years among a population of 42,000.

For South-Eastern Germany we have an account by Raimann² of the number of operations for stone from 1820 to 1830 in the various provinces of Austria. If we assume this to be trustworthy, we get the following annual ratios of operations per 100,000 inhabitants:

Lower Austria.....	0.70	Styria.....	0.20
Bohemia	0.30	Tyrol	0.14
Upper Austria.....	0.21	Galizia	0.04
Moravia.....	0.20	Illyria	0.03

The large number for Lower Austria is explained more readily by the fact that the patients had gone to Vienna to be operated on, than by assuming any preponderance of the disease in that city itself.

Concerning the distribution of calculus in *England*, we have a series of well-grounded facts taken partly from the registers of deaths³ and partly from hospital statistics,⁴ by

¹ Quoted by Schmidt.

² 'Oest. med. Jahrb.,' Nst. F., 1832, iii, Heft 4, 521.

³ The death-returns have only a limited value for deciding this question: firstly, because undoubtedly a good many errors of diagnosis are made in referring the cause of death to stone in the bladder; and secondly, because the number of deaths following operation for calculus is bound to be very much less in those centres where skilled operators are at the service of the public, where accordingly most operations are done, than in places where there is no such expert skill. The same circumstance has to be taken into account in the hospital statistics.

⁴ Dobson, 'Med. Comment. of Fixed Air,' Chester, 1779; Smith, 'Transact. of the Med.-Chir. Soc., xi, 1; Marcet, 'Essay on the History and Treatment of Calculous Disorder,' Lond., 1817; Yelloly, 'Philos. Transact.,' 1829, 55, also in 'Lond. Med. Gaz.,' 1829, March, 522; Cadge, 'Med. Times and Gaz.,' 1870, July, 108, 1874, Aug., 183.

which, as well as by evidence of another kind, it appears that the disease is most common in the county of Norfolk.¹ The following table compiled by Cadge from the death-returns of five years (1867-71), gives the proportion of inhabitants in the several counties for each death from stone during that period (for the reasons stated in the note, these figures are to be taken with some allowance) :

*Deaths from Urinary Calculus in English Counties during Five Years.*²

Eastern Counties, 1 in 63,475 pop.	Southern Midlands ... 1 in 86,367
Norfolk ³ 1 in 42,744	Hunts 1 in 59,137
Suffolk 1 in 67,081	Bucks 1 in 61,335
London 1 in 70,099	Herts 1 in 68,250
Wales and Monmouth, 1 in 77,202	Cambs 1 in 69,845
Yorkshire 1 in 77,520	Northampton 1 in 82,525
West Riding 1 in 61,405	Western Midlands ... 1 in 128,216
N. and E. Riding } 1 in 71,475	Warwick 1 in 65,670
and York }	Shropshire 1 in 66,750
South-Eastern Counties, 1 in 83,978	Worcester 1 in 73,100
Kent 1 in 60,585	Stafford 1 in 76,965
Sussex 1 in 61,139	Northern Counties ... 1 in 191,875
Berks 1 in 93,470	S.-Western Counties 1 in 203,985
Northern Midlands ... 1 in 85,959	N.-Western Counties, 1 in 209,681
Leicestershire 1 in 64,115	

There are doubtless some slight errors in the figures; but, disregarding these, we find the highest mortality from calculus in the counties of Norfolk, Huntingdon, Kent, Sussex, Buckingham, West Riding of York, and Leicester: that is to say, in the eastern and southern counties (and the West Riding); the smallest mortality, again, is in the northern and western districts.

In *Scotland* the malady would seem to be more frequent than in England, Hutchinson⁴ (in 1830) estimating the proportion of calculus cases in the two countries at five to four.

¹ Besides the above, see England, 'Observ. on the Functional Disorders of the Kidneys, &c.' Lond. (1830); Crosse, 'Treatise on the Formation . . . of the Urinary Calculus,' Lond., 1835; Williams, 'Lancet,' 1860, Aug.—Sept.; Plowright, 'Med. Times and Gaz.,' 1855, Aug., 144, and 1885, Octbr., 491.

² From Cadge, l. c., 1874.

³ 'Transact. of the Med.-Chir. Soc.,' 1830, xvi, 94.

⁴ 'Philosoph. Transact.,' 1830, 420.

A comparison of the mortality from stone in Scotland and England makes the difference much greater, the mean death-rate over a period of five years being one in 51,903 for the former country and one in 100,331 for the latter, or almost twice as much in Scotland. We have to bear in mind, however, that the proportion of cases operated on is much greater in England than in Scotland, so that the mortality in the former is considerably lessened.

Cadge points out that in Scottish hospitals with a total of 2151 beds, 171 patients with stone were admitted during the five years' period already referred to; while in English hospitals with 2183 beds (excluding Norwich), 354 cases of calculus, or twice as many, were admitted in the same time. Taking the higher rate of mortality in Scotland along with this, the explanation will be, not that the disease in that country is less frequent, but that a smaller proportion of cases receive hospital treatment.

There is a lack of trustworthy information as to the frequency of the malady in the several counties of Scotland. It is, at all events, exceptionally common in Aberdeenshire: during ten years (1838-43 and 1867-71), 90 patients were operated on for stone in the Aberdeen Infirmary, or nine per annum; and if we assume that these came from the county generally, and estimate the population of the latter at 250,000, we get one case to 27,800 inhabitants.

In *Ireland* stone is exceedingly rare. Yelloly,¹ who inquired very thoroughly into the matter, found that not a single case of operation for stone had occurred from first to last in the hospitals supplying the three-and-a-half millions of people in Antrim, Armagh, Londonderry, Donegal, Fermanagh, Tyrone, Carlow, Kildare, Kilkenny, Longford, Louth, Wicklow, Clare, Kerry, Galway, Roscommon, Tipperary and Mayo; and that no case had come to the knowledge of practitioners among the poorer classes of the people in those counties. In the various hospitals of the counties of Down, Monaghan, Leitrim, Sligo, Limerick and Waterford, with a population of a million-and-a-quarter, there had been nine operations for stone in forty years; in the town of Cork (80,000 pop.) there were thirteen operations in eighteen years, and in Dublin there are about five every year.

¹ 'Edin. Med. and Surg. Journ.,' 1845, July, p. 7.

These older data, proving the great rarity of the malady in Ireland, are borne out by the papers of Wylde,¹ Popham (for Cork especially) and O'Grady;² as well as by the mortality returns, according to which there is one death every year from stone among 214,740 inhabitants.

Few countries of Europe had, down to recent times, a worse repute for urinary calculus than *Holland*; and it is clear that the reputation was deserved. Nonnius,³ v. d. Mye,⁴ Plempius⁵ and other seventeenth-century authorities are unanimous in asserting its great frequency; Rau, who was professor at Leyden in the beginning of the eighteenth century, takes credit to himself for having performed 1547 successful operations for the stone; Camper also speaks of the malady as one of very frequent occurrence, especially in the country between Gouda and Rotterdam. He points out, however, as Schultens⁶ did at a later date, that there had been a considerable decrease of the malady; and of recent years it would appear that the number of cases has fallen to a somewhat low level,⁷ although Buchner speaks of lithiasis being not altogether rare in Gouda, and it has been relatively common in Ostend.⁸

In *Switzerland* calculus is reckoned one of the rarest diseases. What of precise information we have comes from Geneva,⁹ Bern and Freiburg. A circular of questions addressed at the instance of Civiale in 1830 to the practitioners of the canton of Bern elicited the fact that only one case was known to have occurred within the canton for some twenty years.¹⁰ At an association of practitioners of the Canton Freiburg in 1878, it came out that no case of stone had occurred in the practice of any of those present.

Of the frequency of stone in the several departments of

¹ *Ib.*, 1853, July, 56.

² 'Dublin Journ. of Med. Sc.', 1874, Dec., 449.

³ 'De re cibaria,' *Antw.*, 1646, 10, and 'De calculo epistola.'

⁴ 'De arthritide et calculo, &c.,' Haag, 1624.

⁵ 'Fundamenta medicinae,' lib. iii, cap. 4, 5, Lovan, 1638.

⁶ 'Diss. de causis imminutae in Hollandia morbi calculosi frequentiae,' Lugd Batav., 1802.

⁷ Thijssen, 'Geschiedk. Beschouwing der Ziekten in de Nederlanden.'

⁸ Janssens, 'Annal. de la Soc. méd.-chir. de Bruges,' ix, 17.

⁹ Odier, 'Manuel de méd. pratique,' Genève, 1810, 264.

¹⁰ Account in 'Schweizer Zeitschr. für Natur- und Hlkde.,' 1840, v. 111.

France we have very scanty information. According to Civiale's¹ calculation for the period from 1820 to 1830, there were 6.95 cases per 100,000 inhabitants all over the country, the proportion varying as in the subjoined table :

Landes	0.35	Seine-Marne	7.26
Sarthe	2.46	Deux-Sèvres	8.57
Lot	2.81	Aube	9.33
Tarn	2.86	Haute-Marne	15.61
Lozère	3.62	Var	16.71

According to more recent inquiries by Le Roy d'Etiolles,² the chief seats of the malady are the western districts of Orleans, Tours, Nantes, the Vendée, and the Charente down to Bordeaux. In the north-eastern districts, Lorraine in particular, the disease was at one time at least very common; from Simonin's work³ we learn that the hospital of St. Jacques at Luneville was founded for poor persons suffering from the stone, and that, from 1738 to 1828, the operations done in it for that disease, according to Dr. Castera, an officer of the hospital, numbered 1492, or about 16 in the year, the patients having come from thirty-two communes of the province and 103 of them from Nancy alone. But here also, as Simonin informs us, there has been a decrease of the disease during the present century.

In *Italy* urolithiasis is, generally speaking, common.⁴ Statistics of the number of cases are available only for the quondam Lombardo-Venetian kingdom; the following table gives the mean annual ratio of cases to population as officially reported during the eleven years from 1820 to 1830 :

Calculus in Lombardy and Venetia.

Lombardy, 1 case per 30,300 inhab.	Padua, 1 case per 47,600 inh
Lodi, " 8,800 "	Vicenza, " 62,500 "
Brescia, " 18,500 "	Treviso, " 66,600 "
Cremona, " 23,300 "	Dalmatia, " 77,000 "
Bergamo, " 24,500 "	Udine, " 83,300 "
Milan, " 41,300 "	Belluno, " 83,300 "
Pavia, " 48,000 "	Istria, " 143,000 "
Mantua, " 200,000 "	Verona, " 333,000 "
Venetia, " 71,500 "	Rovigo, " 333,000 "
Venice, " 24,000 "	

¹ L. c., 582. ² 'Traité pratique de la gravelle, &c.,' Par., 1866, 448.

³ 'Recherch. topogr. et méd. sur Nancy, &c.,' Nancy, 1854, 147.

⁴ Guislain, 'Lettres méd. sur l'Italie,' Gand, 1840, 68.

I am unable to say how trustworthy these figures may be, or how far applicable to the present date. For the years 1830-44, the whole number of patients treated for calculus in Lombardy is given¹ at 1094, or an annual average of 73; this gives a ratio of one to 36,000 inhabitants, which corresponds on the whole to the ratios in the above table. Again, in the province of Cremona, there were 248 cases from 1830 to 1844, or one case annually to 20,000 inhabitants.² But within these provinces considerable differences may be remarked in the number of cases in the several districts; thus Balardini³ informs us that, whereas calculus is not often seen in the district of Sondrio, it is common in Valcamonica close at hand, as well as in other parts of the province of Bergamo; and in the province of Cremona there is most of it in the communes along the river Oglio.⁴ In Genoa, according to Civiale, calculus is so rare that only twenty cases had been admitted into the hospitals during seven years from among a population of 200,000. In the general hospital of Turin, with an annual admission of 3500 to 4000 patients, there were only 188 patients treated for calculus during ten years; of these thirteen came from the city and the remainder from the districts around. As regards Rome, Valentiner⁵ would give the disease as rather common; but there is more of it in Naples,⁶ and in certain districts of Sicily;⁷ for which we have no further particulars. It is common also in the *Balearic Islands*.⁸

Of its distribution in *Spain*, I know no more than that it

¹ Corradi, 'Della chirurgia in Italia,' Bologna, 1871, 612.

² Tassani, 'Gaz. med di Milano,' 1847, 173.

³ 'Topogr. statist.-med. della provincia di Sondrio,' Milano, 1834, 65.

⁴ Tassani, l. c.

⁵ 'Berliner klin. Wochenschr.,' 1870, 558.

⁶ De Renzi, 'Topogr. e stat. med. della città di Napoli,' Nap., 1845, 326. According to an earlier paper of his ('Filiat. Sebez.,' 1835, and 'Gaz. méd. de Paris,' 1836, 62), there were admitted from 1821 to 1834 into the hospitals Degli Incurabili and Maria di Loreto 454 patients with stone, and in the autumn of 1835, 26 patients.

⁷ Ziermann, 'Ueber die vorherrschenden Krankheiten Siciliens,' Hannov., 1819, 15.

⁸ Orfila in Magendie, 'Untersuchungen über den Harngrües,' from the French, Leipz., 1830, 46 (relates to Majorca); Cleghorn, 'Beob. über die epid. Krankh. auf Minorca,' from the English, Gotha, 1776, 87 (relates to Minorca).

was very common, towards the end of last century, in Estremadura (Merida in particular) and in Asturias, while it was hardly known in Madrid or other parts of Castile.¹ The latter fact was subsequently confirmed by Hisern.² Around Malaga, calculus would seem to be relatively common.³

Our information for *Hungary* is confined, so far as I know, to the papers on lithiasis by Balassa⁴ and Bókai.⁵ According to the former, there were 135 cases of stone admitted in twelve years into the hospital of Buda-Pesth, that institution receiving nearly all the poor patients with calculus, owing to the want of free hospitals of the larger sort throughout the country; 40 of these cases came from the county of Pesth, 14 each from the county of Tolna and the district of Jazigia, 7 from the county of Szolnok, 5 from each of the counties of Bars and Komorn, 4 each from Békés, Gömör and Kumania, and the rest from various other counties. According to Bókai, there have been 299 cases of stone treated in the Clinique for Children at Buda-Pesth; 159 of these came from the city itself, and the rest belonged to southern districts, mostly level but on the western side mountainous, while the valley of the Theiss and the Northern Carpathians furnished the smallest number, although the same districts sent many patients to the hospital with other diseases. These facts serve at least to show that calculus is not rare in Hungary.

In *Turkey*, the southern provinces of Macedonia, Epirus and Thessaly are given as chief seats of calculus;⁶ in Constantinople and the northern provinces it is rare.⁷ As regards *Greece*, we learn from Stephanos⁸ that stone is nowhere at all common except in Argolis, in the central

¹ Thiéry, 'Observ. de physique et de méd., &c.,' Paris, 1791, i, 262; ii, 10, 107.

² 'Revue méd.,' 1840, Sptbr., 372.

³ Curran, 'Dublin Quart. Journ. of Med. Sc.,' 1871, li, 314.

⁴ 'Wien. med. Wochenschr.,' 1858, 441, and 'Ztschr. für Naturw. und Hlde. in Ungarn,' 1859, Nr. 18, 137.

⁵ In Gerhardt's 'Handb. der Kinderkr.,' 1878, iv, Abth. iii, 557; see also Neubauer, 'Jahrb. für Kinderheilkunde,' 1872, v, 316; 1873, vi, 341.

⁶ Oppenheim, 'Ueber den Zustand der Heilkunde und über die Volkskr. in der Türkei,' Hamb., 1833, 121.

⁷ Rigler, 'Die Türkei und deren Bewohner,' ii, 324; Sandwith, 'Assoc. Med. Journ.,' 1854, May, 435.

⁸ Stephanos, 'La Grèce, &c.,' Par., 1884, 547.

plain of Crete, the island of Santorin, and in a few villages on the slope of Taygetus. It is rarely seen in the *Ionian Islands*; ¹ in one *Maltese* village (Birchirkara) it is said to be endemic.²

Of the distribution of calculus in the Western Hemisphere, we have only scanty and casual notices; it is impossible, therefore, to make our survey a general one. It is common in *Canada*, according to the testimony of United States practitioners;³ and we may perhaps find a confirmation of that statement so far as concerns Montreal in the fact that one of the surgeons of that city had operated for stone forty times within a few years.⁴ During the present century, calculus has been seldom seen in the *New England States*, as well as in *New York State* and *Pennsylvania*. Although Boston used to be notorious for the frequency of calculus,⁵ Warren, who commenced practice there about the beginning of the century, had only twenty-five operations in forty years, three of them being in residents of Boston and the vicinity and the rest in patients who had come from various parts of the States. In the Pennsylvania Hospital of Philadelphia, only sixty-one patients with stone had been admitted in seventy-nine years (1756-1835).⁶ The disease would seem to be rare also in Maryland, North and South Carolina, and Georgia; for the western and north-western parts of N. Carolina, we have information to that effect by Schaffner.⁷ Gross,⁸ who had large experience, places the chief centres of the malady in recent times in *Kentucky*, *Tennessee*,⁹ *Virginia*,¹⁰

¹ Heunen, 'Sketches of the Med. Topogr. of the Mediterranean, &c.,' Lond., 1830, 500; Stephanos, l. c.

² *Ib.*, 190, 414. According to Civiale (l. c., p. 576) there were only four cases of stone treated in the hospital of La Valette during ten years.

³ 'Transact. of the Amer. Med. Assoc.,' 1848, ii, 161.

⁴ Warren, 'Amer. Journ. of Med. Sc.,' 1844, Oct., 292.

⁵ Flint in Willis, 'Urinary Diseases and their Treatment,' Lond., 1838 (Germ transl., Eisenach, 1841, 89).

⁶ Coates, 'Amer. Journ. of Med. Sc.,' 1835, Nov., 97.

⁷ 'Transact. of the State Med. Soc. of North Carolina,' 1868.

⁸ 'Treatise on the Diseases . . . of the Urinary Bladder, &c.,' Philad., 1855, 883.

⁹ Eve ('Synopsis and Analysis of One Hundred Cases of Lithotomy, &c.,' d operations for stone in Nashville during

western counties of Virginia adjoining

Ohio, the north of *Alabama*, and perhaps *Missouri*; while he would regard it as relatively uncommon, if not absolutely so, in all other parts of the United States. In *Alaska* during five years, Blaschke¹ saw only one case of stone. In Monterey, on the coast of Southern California, the disease is quite unknown.²

For *Mexico* we have information by Newton³ that the disease is rare in the capital; Heinemann⁴ saw only four cases at Vera Cruz during six years; Uslar,⁵ however, says that it is often met with at Oaxaca. For the other countries of Central America I have found but one notice, by Bernhard,⁶ who had seen no case of stone in *Nicaragua*, and is disposed to think that it does not occur there at all. In the *West Indies*, according to a number of authorities,⁷ it is extremely rare, to say the least; and, so far as our scanty information goes, the same holds good for the greater part of South America, including *British Guiana*,⁸ *Surinam*,⁹ *Uruguay*,¹⁰ *Buenos Ayres*,¹¹ and *Peru*. Referring to the last named, Smith says:¹²

"Urinary calculi or gravel is so rare a malady, that I never knew or heard of more than one case during my residence in Peru, and that particular instance occurred in the person of a rich and elderly miner from the mining district of Cerro Pasco."

In *Entre Rios*, however, calculus is not uncommon.¹³ In *Brazil*, also, it would seem to be more frequent than we

¹ 'Topogr. med. port. Novi-Archangelcensis,' Petrop., 1842, 73.

² King, 'Amer. Journ. of Med. Sc.,' 1853, Apr., 389.

³ Newton, 'Med. Topogr. of the City of Mexico,' New York, 1848.

⁴ In 'Virchow's Archiv,' 1873, lviii, 183.

⁵ 'Preuss. med. Vereins-Ztg.,' 1843, Nr. 16.

⁶ 'Deutsche Klinik,' 1854, Nr. 2.

⁷ Moseley, 'Treatise on Tropical Diseases,' Lond., 1787 (German ed., Nürnberg, 1790, 81); Lemprière, 'Pract. Observ. on the Diseases . . . in Jamaica, &c.,' Lond., 1799, i, 50, and Edwards, 'Edinb. Med. Journ.,' 1860, Jan., 676, for Jamaica; Jackson, 'Boston Med. and Surg. Journ.,' 1867, July, for Barbados.

⁸ Blair, 'Account of the last Yellow Fever Epidemic, &c.,' 20.

⁹ Hille, 'Wochenschr. für die ges. Hlkde.,' 1845, 8.

¹⁰ Saurel, 'Climatologie méd. de Montevideo,' Montp., 1851, 154.

¹¹ Civiale, l. c.; Mantegazza, 'Lettere med. sulla America meridionale,' Milano, 1860, i, 328.

¹² 'Edinb. Med. and Surg. Journ.,' 1841, Oct., 400.

¹³ Mantegazza, l. c., 118.

might suppose from the imperfect notices about it;¹ although that can hardly be the case at Rio de Janeiro, where only three cases of lithotomy and one of lithotripsy are recorded among 1481 operations done at the great hospital of Santa Casa de Misericórdia from 1861 to 1866.² In the medical writings from Chili, nothing is said of calculus.

§ 137. ALLEGED INFLUENCE OF A COLD AND DAMP CLIMATE.

However defective this sketch of the distribution of urolithiasis may be, it will serve at least to bring before us a number of considerations that will be of use in forming a judgment upon important points both in the external and the constitutional factors of the pathogenesis.

At a time when the occurrence of stone in equatorial and subtropical regions was still unknown (excepting in Egypt and Syria), and the conviction prevailed that lower latitudes were free from it, the attention of observers was concentrated on the frequency of the disease in Holland, England and other countries within the temperate and cold zones; and it was thought that some special importance for the production of the malady was to be attributed to climatic influences, cold and damp more particularly. Since that time, however, evidence has been adduced that many parts of Southern Europe (Italy and Spain) and of Southern Asia (Syria, Persia, Arabia, India) are eminently liable to calculus; on the other hand, that countries with a decidedly cold and wet climate, such as Norway and Sweden, the North German plain and Alaska, are remarkably free from it; while in others, such as Holland, the number of cases has decreased very much of late without any accompanying changes in the climate. All these facts cannot but make the climatic doctrine seem erroneous. Earlier writers such as England³ and Crosse⁴ had laid special stress on the cold and wet climate of Norfolk to account for the great frequency of it in that county; Cadge,⁵ however, justly remarks that

¹ Pleasants, 'Amer. Journ. of Med. Sc.,' 1842, July, 88; Signet et des malad. du Brésil,' 416.

² Bourel-Roncière, 'Arch. de méd. nav.,' 1872, Avril, 27.

³ L. c., 90.

⁴ L. c., 5.

⁵

many parts of the north of Scotland, as well as of Ireland, where the climatic influences are the same, and yet there is none of the disease; and that in Norfolk itself the places on the coast least favorably situated as regards climate, are less subject to stone than the inland parishes. Another fact worthy of note for the question before us is that endemic centres of stone are often very definitely bounded, the malady being extremely rare all round about although the climatic conditions are the same. In that sense Thiry¹ had remarked concerning the endemic occurrence of lithiasis in Estremadura: "We need not take the climate into account, because in Castile, where it is as similar as possible, these maladies are extremely rare." A still more classical instance of this is the localisation of the disease, as above given, in Altenburg and in the parts of Würtemberg along the Danube. These and many other facts of the same kind in the natural history of the disease are evidence, in my opinion, that climate, if it have any influence at all on the occurrence and frequency of urolithiasis, has but a very slight and perhaps an indirect influence.

§ 138. THE RELATION TO CHALK SOIL.

One of the oldest and most universal theories of the origin of urolithiasis associates the frequency or endemicity of it at certain parts of the world with the large amount of lime, or the great degree of hardness of the water commonly used therein. And inasmuch as the mineral ingredients of the latter depend on the peculiarities of the soil, the inquirer is driven to entertain the proposition that the disease as an endemic is associated with certain *geological formations*, and with *chalk soil* in particular. Heusinger was the first, so far as I know, to propound the opinion,² based on a few facts, that urinary calculus in its more considerable diffusion occurs only on chalk, Jurassic limestone, or other more recent calcareous formations; and that view was subsequently

¹ L. c., ii, p. 11.

² 'Wochenschr. für die ges. Hkde.,' 1842, 359.

adopted by Escherich¹ and others on a wider induction, as well as by Textor, who did not, however, share the opinion that the use of hard water was an essential cause of the malady. When we survey the distribution-area of the disease, we certainly discover an imposing array of facts that can be used in support of that doctrine: such as the prevalence of the disease on the calcareous and dolomite soil in the basins of the Don and Volga in Russia (to which Becketow has lately called attention), on the chalk soil of the Eastern counties of England, and on the Jurassic limestone of the Swabian Alp in Würtemberg, beyond the limits of which, as on the keuper of the Necker valley, or on the muschelkalk (Triassic formation) of Franconia, the Spessart and the Rhön, calculus is very unusual; further, in some parts of Italy with a soil of limestone, such as the provinces of Brescia and Cremona, on the chalk and limestone of Syria, on the Jurassic limestone of Montreal, in a part of Maine² with the same formation, and in Lexington, Ky., which stands on more recent limestone. But this geological agreement of a number of centres of calculus, very striking though it be, loses no small part of its significance when we go farther afield. We have to take into account, on the one hand, that the disease is indigenous to an equal extent upon other kinds of soil: such as the basaltic trapp formations in several parts of the Deccan, the basalt and volcanic tufa in Mauritius and Réunion, the alluvium-covered granite of Canton, the transition-rocks of North Wales, the carboniferous limestone of Yorkshire, the zechstein of Altenburg (as above referred to), the red sandstone and variegated sandstone of the Rajestan states and other parts of Hindostan, the keuper and muschelkalk of the plateau of Lorraine, and the clay soil of Reval and Ostend. On the other hand we have to bear in mind that large territories belonging to the more recent limestone, chalk, or Jurassic formations are almost exempt from the malady: such as the limestone coast-margin of Barbadoes and other West Indian islands, the Jurassic formation of the whole Western Switzerland and other parts of the country of England.

¹ 'Bayer. med. Correspondenzbl'

Parsons¹ writes as follows of the bearing of his Somerset experiences upon the soil-theory: "On this theory, it seems to me that it would be very difficult to explain the almost complete immunity from stone in the bladder enjoyed in this neighbourhood near Frome. We have in this district a great variety of strata, most of them calcareous—e. g. chalk, lower oolite and mountain limestone: and the drinking-water, obtained from wells and springs, is therefore almost always very hard; yet stone in the bladder is a disease all but unknown. I have inquired of all my medical friends in Frome, several of whom have practised in the neighbourhood for thirty years, and I can hear of only a single case."

§ 139. EVIDENCE AS TO THE EFFECTS OF DRINKING-WATER OF CALCULUS.

It is obvious that the soil can only be considered important as a factor of the pathogenesis in so far as it imparts certain qualities to that which issues from it and comes into direct relation with man, and most of all to the *drinking-water*. The latter, as an element in the nutrition, might serve to induce disease; and it is in the sense of affecting the quality of the drinking-water that the abundance of mineral matters in the soil, particularly of lime and magnesia, has been interpreted as entering into the causation of calculus.

The opinion that certain properties inherent in the drinking-water were a real cause in the formation of calculus, is met with in the medical writings of antiquity, such as Hippocrates, Galen² and Aetius.³ The last-named recommends that a person operated on for stone should be provided with "*ipsam etiam aquam per omnem victum purissimam et percolatam*," so as to prevent recurrence. We find the same opinion in the Arabian writings, and in those of the later mediæval and the modern period, special emphasis being laid on water that owes its hardness to selenite i. e. sulphate of lime. In recent times, also, the endemic prevalence of the malady has been ascribed to the same cause by many observers: such as Cleghorn for Minorca,

¹ 'Brit. Med. Journ.,' 1872, Nov., p. 493.

² In 'Hippokratidis lib. de humoribus comment.,' iii, § 4, 20, ed. Kühn, xvi, 364, 438; 'De affect. renum,' cap. 5 e. c., xix, 674 u. a.

³ 'Tetrabibl.,' iii, Sermo iii, cap. 6.

Thièry for Estremadura, Prout,¹ Cadge,² Murray³ and others for Norfolk, Roos for the neighbourhood of Moscow, Riedel for the Swabian Alp, Tassani for Cremona, Clot-Bey for Egypt and Balfour for India; while others have discovered negative evidence for it in the fact that localities supplied by water free from lime are exempt from calculus. Without mentioning for the moment certain reasons that should weigh heavily in the opposite scale, we find the general relevancy of this theory contradicted by the fact that the use of a comparatively pure water, with little or no lime in it, does not prevent calculus being endemic at many places; whereas in other localities, where there is a large amount of lime in the water, the malady is either rare or altogether unknown.

I shall give here only a few of the facts illustrating these exceptions to the rule. Geinitz remarks that in a district of Altenburg subject to stone, the water used issues in springs from the zechstein; but the same water supplies the adjoining territory of Reuss where the disease is very uncommon. Referring to Ulm, Majer says: "I am not inclined to rate very highly the part played by water [in producing the disease]; for there are other localities with much harder water, and at the same time little liable to stone." Autenrieth says that a very hard spring-water is used along the whole north-western side of the Swabian Alp, although only a few localities can show a considerable number of cases of stone. To the same effect Kräutle⁴ writes of Munderkingen (a parish of Ehingen): "Although the drinking-water flows out of a bottom of the fresh-water formation and contains a good deal of chalk, yet stone is comparatively rare, and the water can hardly be assumed to have any influence in its production." Bilfinger⁵ also says: "In the Alp-localities [where the disease is most common] the water mostly drunk is taken from rain-cisterns, so that I am inclined to think the drinking-water contributes little to the causation of the malady in question." In Sigmaringen, which is much subject to stone, the water is pure in some of the villages, and in others it contains lime. Garzaroli⁶ expresses his surprise at calculus being so rare in Trieste, since the water of the town, derived from the "karst," contains a large amount of carbonate of lime. On the same point Polak says of Persia: "The disease is met with equally in the marshy ground by the Caspian, where the water is brackish, and in association with the highly calca-

¹ 'Inquiry into the Nature and Treatment of Diseases, Calculus, &c.' Edinb., 1825, 119.

² L. c., 1874, 188.

³ 'Med. Times and Gaz.', Oct., 439.

⁴ Schmid, l. c., 193.

⁵ Ib.

⁶ 'Oest. med. Jahrb.,' Nov., 1853, iii, 532.

rious sedimentary waters of Demavend, Laristan and Meshet, or the waters of Hamadan issuing from volcanic ground, or the saline waters of Koom." Several Anglo-Indian practitioners point out that in many parts of India that are peculiarly subject to calculus, such as the upper basin of the Ganges and the Punjab, the cause of the malady is not discoverable in the hardness of the water. The statements of several English practitioners in China as to the relation of the disease to the cause in question are specially worthy of note. Thus Kerr¹ says: "As tea is the universal beverage of the Chinese, they do not drink water until it has been boiled, and the lime which it contains is thereby precipitated to a greater or less extent. It is a very rare thing for a Chinaman, even of the poorest classes, to drink cold water. In this country, therefore, the disease cannot be attributed to the use of water impregnated with the salts of lime." And Dudgeon,² who confirms the fact, proceeds to ask: "How are we to account for the presence of stone at Canton, where river-water is, as I suppose, entirely used?" Fraser says that the malady is as common on the plateau of Shoa, in Abyssinia, where the water comes pure out of the trachyte, as in Lower Egypt where it runs turbid and muddy at the bottom of its channels. I coincide these citations with the following particularly interesting statement of Livingstone relating to the interior of Southern Africa: "I never met with a case [of stone in the bladder or gravel], though the waters are often so strongly impregnated with the sulphate of lime that needles quickly become encrusted with the salt."

§ 140. SPECIALLY A DISEASE OF CHILDHOOD.

Although we have not succeeded hitherto in reaching a satisfactory conclusion as to the conditions that underlie the formation of renal and vesical calculus, or as to their mode of origin; still, when we have regard to the circumstances under which the disease is found, and found more especially in great extent as an endemic, we shall be driven to conclude that the real etiological factors in the establishment of this pathological process are to be looked for much rather in a disposition of the individual, congenital or acquired, or in certain habits of life and nutrition, than in any exterior influences, climatic or telluric. Without going into this question of the pathology of urolithiasis farther than the scope of my task requires, I shall have to speak of

¹ 'Amer. Journ. of Med. Sc.,' 1862, July, 93.

² 'Med. Times and Gaz.,' 1876, Sept., 252.

these dispositions rather more intimately and with a special view to the instances where the malady is somewhat general.

Among them circumstances of *age* and *sex* take the first place. As early as the Greek medicine we find precise references to the frequency of stone in childhood: for example, in the Hippocratic Collection,¹ in Aretaeus,² in Galen, who speaks³ of it as a malady proper to boys (αἱ δὲ λιθιάσεις ἴδιον ἐστὶ τῶν παίδων πάθημα), and in later writers of antiquity. The mediæval and modern authorities take the same view, the latter furnishing post-mortem evidence of the frequent occurrence of renal calculus in the fœtus or in the newborn child. This fact has come to definite expression in the statistics of operations, which show that more than half of all the cases operated on were under sixteen years.

Of 435 operations for stone in India, 284, or 65·3 per cent. were in patients under fifteen;⁴ in Persia, Polak operated on 122 children of fourteen years and under, in a total of 158 cases, or 77 per cent.; at Beyrout, in a total of 114 operations, 83, or 64 per cent. were in children (Post); at Smyrna among 69 cases there were 56, or 81 per cent., not over twenty years (West); at Nashville, Tenn., there were 45 children under fourteen in 100 operations (Eve); at St. Clair, Pa., there were 41 children under fourteen, in a total of 45 cases;⁵ in England, according to an old table of Prout's, there were 500 operations under the age of ten in a total of 1256; at Bristol, 182 under ten in 354 operations,⁶ and at Guy's Hospital 115 under ten in 230 operations.⁷ In a total of 469 operations at a hospital in Moscow, there were 323, or about 70 per cent., up to the age of fifteen;⁸ in the Government of Kursk, according to Guttceit,⁹ the cases of stone are almost entirely in children, and the same is true, according to Ucke, for the Government of Samara. Of 347 operations for stone performed by Würtemberg surgeons (Zett, Renz and Palm) on the Swabian Alp, 232, or 67 per cent., were in children up to fourteen years of age.

¹ 'Aphor.,' Sect. iii, § 26, ed. Littré, iv, 498; 'De morbis,' lib. iv, cap. 55, e. c., vii, 601.

² 'De causis et signis diuturnor. morbor.,' lib. ii, cap. iii, ed. Kühn, 138.

³ Comment. in 'Hipp. Aphor.,' cap. xxvi, ed. Kühn, xvii, B. 634.

⁴ According to Burnard, Brett, Asher, Durand, Bainbridge, and Curran.

⁵ Carr, 'Philad. Med. Times,' 1877, March, 295.

⁶ Smith, 'Transact. of the Med.-Chir. Soc.,'

⁷ Bryant, ib., xlv.

⁸ v. Roos, 'Württ' rrespdzbl.,'

⁹ 'Med. Ztg. Rv' 24

But the relative amount of urolithiasis in the age of childhood is unquestionably much greater than these data show, for the reason that most urinary calculi, except the phosphatic, begin in the kidney or in the pelvis of the kidney, the uric acid calculi arising in connexion with the infarcts of that substance in the newborn; they undergo an extremely slow development there and subsequently in the bladder, so that the symptoms of calculous disorder do not become apparent until a late period of the stone's existence. It is, therefore, a well-grounded surmise that many cases of uric-acid or oxalic-acid calculus, which present no symptoms until the patient is advanced in years, have to be referred for their first rudiments to an early period of life.

§ 141. COMPARATIVELY RARE IN WOMEN.

As a predisposing cause *sex* is of not less importance for the origin of urolithiasis. It was well known to the practitioners of ancient times¹ as well as to other old writers² that the disease is much more common in the male sex than in the female; and that notion has been fully borne out by recent statistics.

Marcet³ enumerates 28 female cases among 506 patients treated for stone at the Norwich Hospital, or 5·5 per cent.; and Smith gives 75 among a total of 1554, or 4·8 per cent. In 1449 patients with stone in the various provinces of Austria, 82 were of the female sex (v. Raimann). In the surgical clinique of Pesth, the female patients treated for lithiasis were 7·5 of the whole; but in the clinique for children they were only 10 in 299, or 3·7 per cent. (Bókai). The lowest percentage is that of the surgical clinique at Moscow, where there were only 4 female cases in a total of 1792 (Klien). Among 382 cases of operation for stone in the Swabian Alp by Zett, Renz and Palm, there were only 13 in women (3·4 per cent.). Curran says with reference to his experience

¹ In the ancient treatise, 'De affectuum renibus insidentium dignotione,' wrongly attributed to Galen (ed. Kühn, xix, 652, cap. ii), the rarity of stone in the female is explained by the shortness, width, and straight course of the urethra.

² See Steinmann, 'Diss. cur frequentius viri præ feminis calculosi fiant,' Argentor., 1750.

³ 'Essay on the Chemical History and Medical Treatment of Calculous Disorders,' Lond., 1817. German ed., Bremen, 1838.

of stone in India: "I never met a woman of either sect (Mohammedan or Hindu) who laboured under the complaint. Not that women are altogether exempt, for such is not the case; but the number of them that suffer bears no proportion to that of the men. . . . A friend of mine of many years' standing in India, and a very successful lithotomist too, assured me that he had only met two cases in women during his time, and I never knew a surgeon there who had seen more."

The female sex would seem, then, to be implicated to the extent of 4·5 per cent. at the utmost. It is doubtful whether the view is correct which was held by the Greek writers and almost universally adopted in later times, that this rarity in the female is solely to be explained by the shortness and width of the urethra, that is to say, by the greater ease with which gravel and small stones can pass from the bladder. So far as I know, there is a lack of trustworthy clinical experience on the point.

§ 142. RACIAL IMMUNITY OF THE NEGRO.

It is very much open to question whether *peculiarities of race* make a predisposition to calculus. The assertion of Huillet,¹ and a suggestion of the same sort by Asher,² that the disease in India is rare among Hindus, are most decidedly contradicted by Curran, who says that stone is as common among the Hindu population as it is among the Mohammedan. The negro race, however, seems to enjoy a very decided if not an absolute immunity. It is a notable fact that not one of all the authorities for the countries of the negro on the West Coast of Africa makes any mention of calculus, with the exception of Quintin, who speaks of its occurrence in a district of the Soudan to the east of Senegambia; and although I am just as little inclined to disbelieve the statement of that writer as to trust absolutely to the statement of Livingstone that the disease is entirely absent from the whole interior of Southern Africa, yet there are many other observations to be mentioned in the sequel, which lead me to take the assertion of the disease being present in

¹ 'Arch. de méd. nav.,' 1868, Ép. 1.

² 'Transact. of the Bombay Med. Soc.,' N. Ser., vii, 28.

Segu as true only within modest limits. Clot-Bey, Pruner, Reyer, and others are agreed that calculus is never seen in negroes in Egypt: Polak says of his Persian practice: "Negroes never came under my treatment; and I heard of only one individual of that race, from whom a surgeon extracted a stone by the rectum." In the West Indies calculus is rare in those of every colour; but Edwards says that he had seen it only once in a negro in Jamaica. Among 100 patients operated on for stone by Eve at Nashville, Tenn., during thirty years, there were 6 negroes, 6 mulattoes and 88 whites.

§ 143. AFFECTS THE POOR IN YOUTH AND THE RICH IN LATER LIFE.

However essential as a factor in the pathogenesis predisposition may be, showing itself according to the period of life, there can at the same time be no question that this congenital disposition is capable of being intensified, and that a disposition of the same kind may under certain circumstances be acquired. These causative circumstances we shall have to look for in manner of life and kind of nutrition, as well as in *social conditions* at large, proper to the individual or to the population of a place or of a region.

The determining influence of that factor on the occurrence of calculus is shown, first and foremost, by what has been observed also in other constitutional diseases of the same group such as scurvy and gout, namely that the malady has become decidedly *less frequent* of late in several countries, such as Holland, the Swabian Alp, Lorraine, Boston, U.S., perhaps also in some of the affected English localities, although there has not been the smallest change in the climate or state of the soil. It is obvious that in this case, as in the instances of scurvy and gout, we have to take note of the favorable influence of an improved hygiene. Another argument for the influence of social conditions may be discovered in the fact that there are differences in the amount of the disease between *town and country*. In some regions the preponderance is in the rural districts:

as in Hungary (according to Balassa), in Russia (Klien and Ucke) and in India (Asher); in others, again, it is in the towns: as in Spain (Thiéry), in England (Yelloly and others), and in France, according to the following by Fourcault:¹

“D’après la statistique que j’ai entreprise dans plusieurs cantons, pour connaître le nombre proportionnel des calculeux qui se rencontrent dans les petites villes et dans les villages, j’ai trouvé les résultats suivants: Une population urbaine s’élevant à 12,500 âmes a donné, pendant vingt ans, 16 cas de calcul ou de gravelle, tandis que la population rurale, formant un total de 54,800 habitants n’a produit, pendant le même temps, que 14 cas semblables: ce qui donne, toutes conditions égales d’ailleurs, entre les villes et villages un rapport de 5 à 1. Maintenant si l’on considère que la population des petites villes est en partie agricole et industrielle, que la plupart des calculeux sont étrangers à cette portion de la population; si l’on considère en outre que la même remarque est applicable à celle des villages, on pourra conclure avec une certitude entière, que les calculs, comme la goutte, sont rares chez les peuples agriculteurs et les artisans.”

But the fact of greatest importance for the question before us is that calculus, in so far as it affects children, is *much commoner among the poorer classes than among the well-to-do*; while, so far as it affects adults (most of them verging towards old age),² the largest contingent of cases comes from the better-off classes. “Among the lower classes,” says Brodie,³ “children are more liable to calculus than adult persons. On the other hand, among the upper classes of society, very few of our patients are children, and the great majority are persons above fifty years of age.”

In like manner Saucerotte says, with reference to his Lorraine experiences: “Mes devanciers, mes collaborateurs et moi avons observé d’après les tailles que nous avons faites à l’hôpital, en ville ou dans différentes lieux des ci devant Lorraine et Barrois, que chez les indigents, il y a plus d’enfants calculeux, que chez les riches, et que chez ceux-ci,

¹ ‘Journ. des connais. med.-chir.’ 1838, Sept.

² The commonness of stone in the bladder among men at an advanced age is one of the urinary organs (bladder mostly) and being peculiar to the time of life, create an ine.

il y a plus de vieillards attaqués de la pierre, que chez les pauvres."

It is of these elderly patients with stone that Canstatt says:¹ "The cases are most numerous in those classes of society who allow themselves the luxury of frequent meals, a diet of meats, strong wines and other things of the same kind; among the poorer classes the cases are fewer." The preponderance of children's cases among the poor was well known to the practitioners of former centuries, as appears from a remark by Van Swieten.² Yelloly estimates the ratio of calculus among children of the well-to-do to that among children of the poor in England at 1 to 11; and Martineau gives nearly the same proportion for France. Cadge says:³ "In some hundreds of cases of stone which have passed under my own observation, I have met with but one occurring in a child under five years whose parents were well-to-do in the world; and this experience has been corroborated by all those surgeons of whom I have made inquiry."

The observations made in the children's hospital of Pesth show, according to Bókai,⁴ that of 299 patients with stone, 189 were the children of labourers or farm servants, 72 the children of artisans, while only 38 came from all the other classes of the community. The writer informs us also that the same fact has been made out in the surgical clinique of Buda-Pesth, adding in explanation that, if it should be ascribed to the admissions being only from the poorer classes of the people, the incidence of the disease was still a remarkable one on comparing the admissions for other maladies.

§ 144. DIFFERENT KINDS OF CALCULUS.

All these differences in the incidence of the malady may be explained, really, as I think, through *hygienic influences*, or, in the first degree, as most of the authorities think, by the kind of food. There is, however, no agreement among them as to the particular errors of diet that intensify the congenital disposition to calculus in childhood, or create a

¹ 'Handbuch der med. klinik,' 1ste Aufl., Bd. iii, Abth. ii, 831.

² L. c., v, 227.

³ L. c., 1874, p. 187.

⁴ L. c., pp. 583-4.

predisposition to it; in fact there are the greatest inconsistencies in their views, so that one gives, as the cause of the disease, the very thing which another holds to be specially valuable in the child's diet as a prophylactic against the malady. I do not think it incumbent on me to enter more particularly into the question, or to bring forward the various opinions that have been expressed. The fact that deserves to be specially dwelt upon here is, that the character or *chemical composition of the stone* is different at different parts of the world, uratic calculi predominating at many places and oxalic at others; and those differences are to be explained chiefly, if not exclusively, by differences in the dietetic factors upon which the production of the calculous diathesis depends.

Thus, to quote only a few of the data, the stones composed of uric acid or urates were in England 72 per cent. of the whole;¹ in Vienna² about 74 per cent.; in Khiva³ 73 per cent.; in Persia⁴ and China⁵ 83 per cent.; in St. Clair,⁶ Pa., 70 per cent.; in Pesth⁷ only 58 per cent., and in Egypt⁸ 50 per cent. On the other hand oxalates were characteristic of about 70 per cent. of all the calculi examined in Würtemberg,⁹ as well as in India.¹⁰ Oxalic calculi predominated also in Moscow,¹¹ especially in children and youths, uratic formations being met with more frequently in aged patients.

It seems undoubted that oxalates develop in many cases from a chemical change in uratic calculi. But it is impossible to account in that way for their preponderance in certain localities; in such cases we have to think rather of a direct production of oxalates in consequence of the habitual use of *food or drink producing oxalic acid*. In like manner there can be hardly any doubt that urates occur in consequence of the *uric acid diathesis*; and that, apart from individual predisposition, the diathesis may be acquired in

¹ According to Yelloly, Wood ('Lond. Med. and Phys. Journ.,' 1827, Jan., p. 34), and Benecke ('Grundlinien des Stoffwechsels,' Berlin, 1874) from examination of the collections in the museums of hospitals in London, in the Norwich Hospital Museum, and in the Hunterian Museum. Thompson ('Med. Times and Gaz.,' 1870, July, p. 108) has found the same proportion in his practice; of 183 calculi treated by operation, 138 were uratic.

² Uitzmann.

³ West.

⁴ Pol.

⁵ Kerr; Wong also says that in China calculi are mostly

⁶ Carr.

⁷ Bokái.

⁸ I.

⁹ Rapp.

¹⁰ Vandyke Carter.

¹¹

consequence of certain modes of life and habits of nutrition. Lastly, it should not be forgotten that, as lesions of the urinary organs may in individual cases be the real reason why concretions are deposited from the urine, so there may be morbid conditions of those organs more generally diffused among larger or smaller groups of the population, such as would account for an endemic of urolithiasis in one or other of its forms. The only fact of that kind ascertained hitherto is the circumstance shown by Reyer, Bilharz and Griesinger for Lower Egypt, and by Batho for a small part of Cape Colony, that the prevalence of vesical calculus in those countries is owing to the *distoma-disease* being endemic in them.¹ It seems to me to be a not unfruitful line of inquiry to examine whether there may not be something of the same kind, or something analogous, in other countries, especially tropical, which are much subject to urolithiasis, for example Mauritius and Réunion.

§ 145. HEREDITY: RELATION TO GOUT.

The theory of urinary calculi being due to the uric-acid diathesis leads naturally to two other questions: the *relation between calculus and gout* as regards geographical area; and the extension of calculous disorders by way of *inheriting the constitutional liability*.

Taking the latter of these first, the *heredity* of the disposition to calculus was a subject about which the practitioners of the eighteenth century were most unanimous. Stahl went so far as to say "nullum se vidisse calculosum nisi ejus pater aut consanguineorum aliquis hoc eodem morbo vel arthritide laboraverit." The doctrine has found defenders also among surgeons of the most recent period, including men of large experience. Thus Thompson,² in speaking of the prophylaxis of stone, observes: "First of all let me say, going back to the root of the matter, that it is generally more or less hereditary." Cadge³ also, refer-

¹ See vol. ii, 297, and p. 463 of this volume.

² 'Lancet,' 1872, Jan., p. 35.

³ L. c., 1874, Aug., p. 188.

ring to an inherited liability as the cause of stone being endemic in Norwich, says: "I cannot help believing we have an influence acting slowly but potently." In like manner Cantani interprets the experience of calculus in Southern Italy; Zett and Palm (Württemberg) could not but admit a hereditary disposition to the formation of calculus; and Polak gives facts from his Persian practice which must be read the same way. "It is remarkable," says Geinitz concerning the endemic in Altenburg, "that our area of calculus does not follow exactly the boundaries of the province; but it coincides with the dispersion of our Altenburg peasant-farmers. For, both eastwards and westwards, the calculous disorder comes to an abrupt limit exactly with the trunk hose of the Wendish settlers who had migrated from us; and the frequent blood-relationship between the patients with calculus is further evidence of the same kind." In my opinion it is family relationship that weighs, in this instance also, more heavily in the scale than national.

The community of origin *between urolithiasis and gout* does not depend merely on the fact that the same diathesis underlies both morbid processes, or, in other words, that the two processes yield the same product; it comes out also in the clinical experience that the two are not unfrequently combined in the same person, or that they replace each other in members of the same family. This had been remarked by many experienced practitioners of former time, such as Morgagni, Sydenham (who made observations on himself), Boerhaave, van Swieten, and Scudamore; and in later times there have been no objections raised against identifying the two diseases in the sense stated, except by an occasional writer here and there. Thompson, one of the highest authorities in this department of practice, says (l. c., p. 36): "I have frequently seen these two complaints alternating, comparing one generation with another; gout appearing in one, gravel in the second, and then gout in the third. But the same individual may also have alternating attacks of gout and gravel. I have seen a patient suffering years from gout, which ceased for several months, when for the first time a uric-acid stone. The things, then, is unquestionable; they

constitute two different series of phenomena, but both spring from the same root."

But, from the geographical point of view, we are struck by the very considerable difference between the two diseases. First and foremost is the fact that gout is almost a stranger to tropical and subtropical countries, notably in the Eastern Hemisphere; whereas calculus, as we have seen, is a very considerable disease in Syria, Arabia, Persia, India and Egypt, having sometimes even an endemic character. Again, there are a number of centres of stone in temperate latitudes, such as the Swabian Alp, Altenburg, and the interior governments of Russia, in which gout must be reckoned among the diseases that are at all events rare. These are discrepancies that we must add to the considerable number of other puzzling things in the natural history of calculus, for which a solution has yet to be found.

CHAPTER XVI.

DISEASES OF THE GENERATIVE ORGANS.

There are only a few among the diseases of the male or female organs of generation that possess any special interest in a geographical inquiry; and even for these the materials are so scanty and defective, sometimes also so little calculated to inspire confidence, that there cannot be the remotest thought of representing their geographical distribution in any adequate manner. Still less could we hope from such a representation to draw any conclusions about the etiology of the diseases in question, or about the dependence of their origin and diffusion upon exterior influences in general operation. I must therefore confine myself to the discussion of two or three diseases in this group; and I shall not be able to do more than give a very rough sketch of their geographical area.

1. *Hydrocele.*

§ 146. HYDROCELE COMMONEST IN WARM COUNTRIES.

In the absence of statistical returns of the number of cases of hydrocele,¹ we have no safe means of estimating the rarity or frequency of the condition in various parts of the world. It seems to be made out, however, and it has already been

¹ Our sole materials are the recruiting lists of several European States, which serve to show how many persons within a certain limit of age were rejected on account of hydrocele. When we compare several lists of that kind we find the differences in the numbers of persons with hydrocele; thus, in France 1000, and in Italy only 4.9 per 1000. It is obvious that these figures are not on the positive number of cases, but upon something else, which I have further inquired into.

dwelt upon by Marshall,¹ that hydrocele is much more common in *subtropical and equatorial countries* than in higher latitudes, being met with, indeed, in the form of a prevalent endemic malady, at a number of points in the former. Even in some parts of Southern Europe, such as *Spain*,² *Malta*,³ and *Turkey*,⁴ the frequency of the disease comes out prominently in comparison with the number of cases of it in northern regions of the Continent. That holds good still more for *India*,⁵ the *East Indies* (particularly the Riouw-Lingga group⁶) and several of the *Pacific islands* (Tahiti,⁷ Navigators' Islands,⁸ New Caledonia⁹); also for *Egypt*,¹⁰ where hydrocele is reckoned one of the commonest of maladies, so much so that, in a communication¹¹ from Rosetta, it is said that one-third of all the Arab population of the place are subject to it. It is common also in *Zanzibar*,¹² and on the *West Coast of Africa*;¹³ and not less so in certain tropical regions of the Western Hemisphere, such as *Guiana*,¹⁴ the *West Indies*,¹⁵ and *Brazil*,¹⁶ being truly endemic in Rio Janeiro

¹ 'Edin. Med. and Surg. Journ.,' 1832, Oct., 348.

² Gregory, 'London Med. Gazette,' 1828, June, 79.

³ Hennen, 'Sketches of the Med. Topogr. of the Mediterranean, &c.,' Lond., 1830, 500.

⁴ Oppenheim, 'Ueber den Zustand der Heilkunde und über die Volkskr. in der Türkei,' Hamb., 1833, 123; Rigler, 'Die Türkei und deren Bewohner, &c.,' ii, 349.

⁵ Gibson ('Transact. of Bombay Med. Soc.,' 1837, i, 57) for Gujerat; Day ('Madras Quart. Journ. of Med. Sc., 1862, Jan., 34) for Cochin; Fayrer ('Clinical and Pathol. Observations in India,' Lond., 1873) for Bengal; Aubeuf ('Contrik. à l'étude de l'hygiène et des malad. dans l'Inde,' Par., 1882, 68) for Pondicherry; Friedel ('Beitr. zur Kenntn. des Klimas unter der Krankh. Ost-Asiens,' Berl., 1863, 155) for Bangkok (Siam).

⁶ Overbeek de Meijer, 'Nederl. Tijdschr. voor Geneesk.,' 1859, iii, 348.

⁷ Bennett, 'Lond. Med. Gaz.,' 1832, Jan., 629.

⁸ Lacroix, 'Arch. de méd. nav.,' 1866, Janv., 29.

⁹ de Rochas, 'Essai sur la topogr. méd. de la Nouvelle-Calédonie,' Par., 1860, 35.

¹⁰ Clot-Bey, 'Aperçu gén. sur l'Egypte,' ii, 319; Pruner, 'Krankheiten des Orients,' 281; Hartmann, l. c.

¹¹ Martini, 'Hamb. Zeitschr. für die ges. Med.,' 1848, xxxviii, 85.

¹² Burton, 'Zanzibar, its City, &c.,' Lond., 1872.

¹³ Daniell, 'Sketches of the Med. Topogr. of the Gulf of Guinea,' Lond., 1849, 115.

¹⁴ Segond, 'Journ. hebdom. des progrès des sc. méd.,' 1835, Janvier.

¹⁵ Rufz, 'Arch. de méd. nav.,' 1869, Oct., 274; Moulin, 'Introd. à la pathol. de la race nègre dans les pays chauds,' Par., 1866, 23.

¹⁶ Döllinger, 'Wochenschr. f. d. ges. Hkde.,' 1835, 210; Sigaud, 'Du climat et des malad. du Brésil,' Par., 1844, 157, 158, 414; Papillaud, 'Gaz. méd. de

(Weddel) and in Bahia (Sigaud). At Vera Cruz, Heine-
mann¹ has found it to be less common than in these countries.
The extent to which hydrocele is prevalent in several of the
countries named, such as Martinique and the Navigators'
Islands, will appear from the fact that there is a special
class of surgeons who occupy themselves with performing a
rude operation for it.

§ 147. CAUSES OF HYDROCELE IN WARM COUNTRIES.

Several of the authorities entertain the opinion that the
preponderance of the malady in lower latitudes is the direct
effect of *tropical climate*; but that is very doubtful. The
favourite theory of "relaxation of the tissues" or "loss of
tone" due to the action of a tropical climate, really explains
nothing for hydrocele at all events; which cannot be regarded
as a mere passive exudation, but as depending on chronic
inflammatory processes of the tunica vaginalis. Perhaps the
only thing in favour of the origin of the malady from high
temperature is the assertion of Gregory that, in the south of
Spain, hydrocele often shows itself in wide diffusion in spring
and summer, the relaxing heat being blamed for it. I have
searched in vain in the other medical authorities of the
country for a confirmation of that statement; nor have I
found any hint of a similar sequence of things in other
tropical or subtropical countries which are especially subject
to hydrocele. I am therefore obliged to call in question the
trustworthiness of the statement as to Spain.

It is a much more probable explanation, that the real
reason of hydrocele being common in the tropics is some-
thing in the *manner of life* of the inhabitants which has an
injurious effect. First in that category many observers
(Rigler, Pruner, Gibson) would place sexual excesses. Next
in order mention is made of certain disadvantages of the
clothing, mode of locomotion, and the like, varying according
to locality, which are apt to set up irritation in the testes

Paris,' 1848, 624; Rendu, 'Étude topogr. et méd. sur le Brésil,' Par., 1848, 83;
Weddel in Castelnau, 'Expedition.'

¹ In 'Virchow's Arch.,' 1873, lviii, 183.

and their coverings ; for example, the Oriental custom of wearing wide trousers or of having the thighs quite bare, so that the scrotum hangs with nothing to support it ; also the practice, carried to the length of abuse, of bathing the genitals several times a day with cold water, their natural state being one of warmth ; or, lastly, mechanical concussions in riding, particularly on a Turkish saddle, which is very narrow in the middle, with a broad curve before and behind, so that the testes are a good deal concussed whenever the horse is made to canter after the Eastern fashion of riding. Another fact tending to show that some factor residing in the manner of life has the most material effect in making the disease common, is that Europeans, although they do not enjoy an absolute exemption in the countries specially subject to hydrocele, are at all events better off than the natives, *i. e.* the coloured races, the disease being much more widely diffused among the latter than the former.

2. *Orchitis.*

§ 148. PECULIAR EPIDEMIC FORM OF ORCHITIS IN CAYENNE.

A form of orchitis peculiar in its symptoms and in its cause has lately been described by Drago from observations of it in Guiana.¹ He has himself seen it somewhat frequently among the French troops stationed there, and he has learned from Dr. Cazes, of the French navy, that it occurs often among the land- and sea-forces at Martinique, as well as among the pupils of the school of science and art at Fort-de-France.

Usually the patient complains of nothing more at first than a feeling of weight and pain in the scrotum, which increases to a high degree of intensity if he remain long in the erect posture and particularly if he walk about, remitting when he lies down. Pressure on the testis is very acutely felt, and it excites pains which shoot along the spermatic

¹ "Considérations sur une variété d'orchite observée à la Guyanne," Paris, 1880.

cord to the iliac fossa. The skin of the scrotum always looks normal, being neither red nor hot; nor can any change be discovered in the coverings of the testis, or serous effusion into the tunica vaginalis. There is always, however, more or less of swelling of the epididymis, and sometimes of the testis itself, which may reach the size of a hen's egg or even of the fist; also swelling of the spermatic cord, which may become three times as thick as it usually is, and feels either smooth or knotted. On examination by the rectum, not the slightest change was ever discovered in the prostate or vesiculæ seminales. In the 63 cases seen by Drago, 45 had the testis of the left side affected, and 12 that of the right. The malady always ran an acute course of fifteen to twenty-five days, was altogether unaffected by medical interference of whatever kind, and ended all the sooner the more the patient was kept at rest. In every case it ended in complete recovery, although relapses were not unfrequent.

The frequency of the disease among the troops in Cayenne is shown by the fact that Drago saw sixty-three cases of it within a few years among a not very large body of men. None of those attacked had been in garrison less than a year and a half, and they had been mostly in good health before, only a few of them having had slight malarial fever. As to the cause of the malady our author can offer only conjectures of a very problematical kind; at one place he indicates the sluggishness of the circulation, or hyperæmia in the veins of the pelvis, due to the effects of tropical climate; at another place he suggests the constipation that is so common in the tropics as a possible cause; but he does not meet the difficulty that these influences are at work, not in Cayenne only, but in all tropical countries. Injuries, chills, mumps, onanism, gonorrhœa or other urethral irritation, and all other causes that might set up orchitis in ordinary, must be absolutely excluded as factors in this peculiar form of disease.

3. *Irregular Menstruation, Chronic Metritis, Displacements of the Uterus, and Leucorrhœa.*

§ 149. UTERINE DISORDERS IN WARM COUNTRIES.

A place may be found here for a few remarks on the geographical distribution of these maladies of the female organs of generation.

Tschudi's remark, in his paper¹ on leucorrhœa in Peru, that the disease has no geographical limits but occurs everywhere as a result of social influences, applies not only to leucorrhœa but to a large number of maladies of the generative organs of women, which are associated with a chronic mucous flux from the uterus and vagina merely as one of their symptoms. Among them we have to include irregularities of menstruation (dysmenorrhœa, amenorrhœa and metrorrhagia), chronic metritis, and displacements of the womb. It is on the whole correct to say that the distribution of these diseases over the globe depends less upon geographical or climatic influences than upon causes in the social life. But in so far as the latter stand in some sort of relation to the *climate* of a locality, we may conclude *a priori* that this factor will not be without significance for the geographical distribution; and in fact that influence comes out unmistakeably in the experience that these forms of disease *predominate in equatorial and subtropical countries*.

Even in Southern Europe, as in *Southern Italy*² and *Turkey*,³ the great frequency of these disorders of the female sex cannot but be remarked; although here, just as in temperate latitudes, the influence of detrimental conditions of living upon the production of the maladies comes out in the fact that the population of the towns are more subject to them than the country people. They are still more decidedly prevalent in *Algiers*,⁴ *Egypt*,⁵ *Syria* and other subtropical

¹ 'Oester. med. Wochenschr.,' 1846, p. 473.

² Mammi, 'Filiatre Sebezio,' 1842, Nov.; Taussig, 'Venedig von Seiten seiner klimat. Verhältnisse,' Venedig, 1847, 75.

³ Rigler, l. c., ii, 329.

⁴ Deleau, 'Mém. de méd. milit.,' 1842, lii, 230.

⁵ Pruner, l. c., 275.

countries of the East, and in the *Southern States* of the American Union.

Thus King¹ says: "Diseases peculiar to females are far more common in Monterey (South California) than any other class of disorders. Of these the most usual are leucorrhœa, prolapsus uteri and deranged menstruation; those affections are more numerous in proportion to the population in Monterey than in any community I have ever known."

But it is in the tropics that they reach the maximum of frequency; and there they show themselves least dependent upon the injurious influences which a life in cities brings with it. Reference is made to this fact in the writings of several of the observers in the last century; thus Bajon² says that in hot countries leucorrhœa and prolapse of the womb are among the commonest of female troubles, that the vaginal flux occurs in most of the sex, even in their early years, that there are few women in Cayenne, whether white or black, who do not suffer from irregular menstruation, and that European women begin to suffer from it as soon as they arrive in a tropical country. The last of these statements is confirmed by Tilt,³ who recalls his experience in the East Indies and West Indies, China and Brazil, and dwells especially on the frequency of chronic metritis along with inveterate menstrual disorders in European women who had gone to *India*, a fact that to which attention had previously been directed by Stewart.⁴ We have information from other sources about the frequency of these maladies in *Siam*,⁵ (among the Anamese women), in the *Malay Archipelago*,⁶ the *Hawaiian Islands*,⁷ *Senegambia*,⁸ the *West Indies*,⁹ *Entre Rios*,¹⁰ *Peru*,¹¹ and other tropical countries.

¹ 'Amer. Journ. of Med. Sc.,' 1853, Apr., 391.

² 'Nachrichten zur Geschichte von Cayenne u. s. w.,' from the French, Erfurt, 1780, ii, 79.

³ 'Med. Times and Gaz.,' 1860, Jan., 74.

⁴ 'India Journ. of Med. Sc.,' 1836, New Ser., i, 47.

⁵ Beaufils, 'Arch. de méd. nav.,' 1882, Avril, 272.

⁶ v. d. Burg, 'De Geneesheer in Nederlandsch Indie,' Batav., 1882, i, 91.

⁷ Bennett, l. c., 630; Chapin, 'Amer. Journ. of Med. Sc.,' 1837, May, 43.

⁸ Chassaniol, 'Arch. de méd. nav.,' 1865, Mai, 512.

⁹ Savarésy, 'De la fièvre jaune, &c.,' Napl., 1809, 88; Tilt, l. c.

¹⁰ Mantegazza, 'Lettere med. sulla America meridionale,' Milano, 1858, i, 155.

¹¹ Tschudi, l. c.; Smith, 'Edinb. Med. and Surg. Journ.,' 1841, July, 177.

§ 150. COMMENCEMENT OF MENSTRUATION IN VARIOUS COUNTRIES.

All the observers quoted are of one opinion, that there are many detrimental things in the manner of life which make a material part of the causation of these maladies among women in the tropics: such as the life of the harem (special to the Levant) with its bad effects; the dislike of active exercise in the open air; indifference to the catamenial period, not among native women only, but also in Europeans; excessive use of highly seasoned food; frequent administration of laxatives, excessive venery, and, above all, rough handling in childbed, criminal abortion and the like. But we must admit that climate by itself has no small share in producing the morbid condition, when we keep in mind what influence it has on the sexual functions of women, particularly upon the age for menstruation to begin, that is to say, upon puberty or the readiness to conceive.

It appears from the inquiries¹ made in all parts of the world, that menstruation, and with it sexual maturity, arrives at an earlier age in proportion to the height of the mean temperature of the year.

Table of the Ages at which Menstruation begins in various countries.

	Average age of menstruation beginning.	Authority.
Sierra Leone	12'0 years	Winterbottom. ²
Calcutta	12'0 "	Webb, ³ Goodeve. ⁴
Siam	12'4 "	Campbell. ⁵
Constantinople	13'0 "	Rigler. ⁶

¹ On the general question, see Robertson, 'Edinb. Med. and Surg. Journ., 1832, Oct., 227; 1842, July, 112; 1845, July, 156; Raciborsky, 'De la puberté et de l'âge critique chez le femme,' Par., 1846; and Szukits, 'Zeitschr. der Gesellsch. der Wiener Aerzte,' 1857, xiii, 509.

² 'Account of the Native Africans in the neighbourhood of Sierra Leone, &c.' Lond., 1803.

³ 'Pathol. indica,' Lond., 1848, 254.

⁴ Robertson, l. c., 1845, 165.

⁵ 'Edinb. Med. Journ.,' 1862, Sept., 273.

⁶ L. c.

	Average age of menstruation beginning.	Authority.
Martinique	13'5 years	Rufz. ¹
Marseilles.....	14'0 "	} Marc d'Espine. ²
Toulon	14'1 "	
Hungary	14'1 "	
Lyons	14'9 "	Szukits. ³
Paris	14'5 "	Bouchacort. ⁴
England	15'0 "	Raciborsky. ⁵
Warsaw	15'1 "	Robertson. ⁶
Manchester	15'2 "	Lebrun.
Vienna	15'5 "	Robertson.
Stockholm	15'6 "	Szukits.
Göttingen.....	16'0 "	Wistrand.
Norway.....	16'4 "	Osiander. ⁷
Lapland	18'0 "	Faye, ⁸ Vogt. ⁹
		Wretholm.

In correspondence herewith, the first pregnancy is usually found to take place in natives of the tropics between the fourteenth and fifteenth year; sometimes even earlier, as in Senegambia (Winterbottom), Polynesia (Ellis), and in Hindu women (Webb). Of 25 Hindu women, 2 became pregnant for the first time in their eleventh year, 1 in her twelfth, 2 in their thirteenth, 14 in their fourteenth, 4 in their fifteenth, 1 in her sixteenth, and 1 in her eighteenth. Moreover, it appears from indications by various medical writers that the effect of tropical climate in forcing on sexual maturity is not confined to native women, who are but little fettered by morality and the expediencies of Western civilisation, but is unmistakeably manifest also in European women and in their female progeny.

¹ 'Arch. de méd. nav.,' 1869, Nov., 335.

² 'Arch. gén. de méd.,' 1835, Oct.

³ L. c.

⁴ 'Dict. de méd.,' en 25 voll. xix.

⁵ L. c.

⁶ L. c., 1845, 165.

⁷ 'Denkwürdigkeiten für die Heilkde. und Geburtshülfe,' Gött., 1795.

⁸ 'Norsk Mag. for Lægevidensk.,' 1866, ii, Raekke xx, 5.

⁹ Ib., 1867, xxi, 23.

4. *Cancer, especially of the Breast and Womb.*

§ 151. DISTRIBUTION OF CANCER.

As comprehensive a knowledge as possible of the geographical distribution of cancer of the breast and womb is much to be wished, for the sake of the light that it might throw on the etiology of that most disastrous affliction of the female sex. But every attempted research of geographical pathology in that direction is foiled at the outset by the want of trustworthy statistics of mortality. The utility of the returns, in so far as there are any, is so much the less that, in the bills of mortality of certain countries and places, all kinds of malignant tumours are taken together; while in those of others cancer is separated from the rest of tumours, although there are very few returns in which any attention is paid to the incidence of the disease upon this or the other organ. These defects occur not only in the mortality returns of whole countries, but also in the statistics of certain large cities, which ought to be, as regards diagnosis, the most trustworthy for the purpose of our problem. The impracticable state of our knowledge when an inquiry is attempted for the whole globe comes out conspicuously, not so much in the want of information as to the existence and prevalence of cancer in many parts of the world, but in the fact that in all but a few instances there is no attention paid to the frequency of the disease in the female sexual organs, or only such terms used as "common" or "rare," which are of very equivocal value. I have thought it necessary to premise this much, not merely in order to prepare the reader for the incompleteness of what follows, but also to justify myself for going beyond cancer of the breast and womb in this section and for discussing here the question of the *geographical distribution of cancer in general*, so far as the published information on the subject enables me to do.

For an approximate measure of the frequency of cancer in general and of mammary and uterine cancer in particular,

I have drawn up the following table from the lists of mortality in various localities of Europe :¹

Table of the Frequency of Cancer in Various Parts of Europe.

Locality.	Period.	Deaths per 10,000 inhab.	Deaths per 10,000 males.	Deaths per 10,000 females.	Estimated ² deaths due to uterine and mammary cancer.
Hamburg ³	1871-1883	7.6	—	—	—
Bremen ⁴	1875-1878	8.1	—	—	—
Berlin ⁵	1870-1882	5.7	3.9	7.4	3.5
Stuttgart ⁶	1873-1878	6.3	4.1	8.6	4.5
Würzburg ⁷	1852-1855	5.3	—	—	—
Brussels ⁸	1864-1873	3.9	—	—	—
	1874-1878	4.2	—	—	—
Netherlands ⁹	1869-1879	4.9	—	—	—
Nordholland	1870	5.5	—	—	—
Nordbrabant	"	5.4	—	—	—
Utrecht	"	4.9	—	—	—
Zeeland	"	4.6	—	—	—
Gelderland	"	4.4	—	—	—
Friesland	"	3.9	—	—	—
Drenthe	"	3.1	—	—	—
Norway ¹⁰	1862-1866	5.2	—	—	—
Christiania	"	7.0	—	—	—
Christiansund	"	6.2	—	—	—
Trondhjem, town ...	"	9.9	—	—	—
Frederikshald	"	5.7	—	—	—
Kongsberg	"	4.4	—	—	—

¹ I have been obliged to disregard a large number of the statistical returns which I had consulted, on account of their absolute unfitness.

² Following West, Simpson, and other English writers, I have estimated the number of mammary and uterine cancers as the excess of cancers in the female sex over the male.

³ Reports of the Inspector of Health for the City of Hamburg.

⁴ Lorent's Annual Reports on the health of Bremen.

⁵ Taken from the publications of the statistical bureau on the changes in the population of Berlin from 1869 to 1878; also from the statistical year-book of the city.

⁶ 'Die sanitären Verhältnisse und Anstalten der Hauptstadt Stuttgart,' Stuttgart, 1879.

⁷ Virchow, 'Beiträge zur Statistik der Stadt Würzburg,' Würzb., 1859.

⁸ Papers by Janssens in 'Bullet. de l'Acad. de méd. de Belgique.'

⁹ Ewers, 'Bijdrage tot de Bevolkingsleer van Nederlande,' s'Gravenhage, 1882, p. 112.

¹⁰ Kjaer, 'Norsk Magaz. for Laegevidensk,' 1870, ii, Raekke xxiv, pp. 241, 289.

Locality.	Period.	Deaths per 10,000 inhab.	Deaths per 10,000 males.	Deaths per 10,000 females.	Estimated deaths due to uterine and mammary cancer.
Norway—					
Bergen	1862-1866	4.4	—	—	—
Lister, Amt	"	3.9	—	—	—
South Bergen, Amt	"	3.8	—	—	—
England ¹	1850-1859	3.3	2.3	1.3	2.0
	1860-1869	3.8	—	—	—
	1870-1876	4.6	—	—	—
London	1853-1855	4.5	—	—	—
Suffolk	"	3.8	—	—	—
Northampton	"	3.5	—	—	—
Norfolk	"	3.2	—	—	—
Leicester	"	3.0	—	—	—
West Riding	"	2.6	—	—	—
North Wales	"	2.5	—	—	—
Westmoreland	"	2.1	—	—	—
Italy ²	1881-1883	6.1	—	—	—
Lombardy	"	9.3	—	—	—
Emilia	"	8.7	—	—	—
Toscana	"	8.4	—	—	—
Liguria	"	7.0	—	—	—
Venetia	"	6.4	—	—	—
Piedmont	"	5.6	—	—	—
Campania	"	4.7	—	—	—
Abruzzi	"	3.6	—	—	—
Sardinia	"	2.0	—	—	—
Philadelphia ³	1872-1876	4.4	2.8	5.8	3.0
Massachusetts ⁴	1876-1880	4.6	—	—	—

It may be admitted that many of the figures in this table do not express the facts correctly; and, in particular, that the differences, sometimes very considerable, in the death-rate from cancer as between various places far apart or between the several districts of the same country, do not in all cases correspond to differences really existing, but are to be explained by incompleteness in the returns, errors of diagnosis, and the like. Still we should, in my opinion, be going decidedly too far if we were unreservedly to main-

¹ Reports of the Registrar-General.

² 'Statistica delle cause di morte in Italia,' 1881-82-83.

³ Health-reports in the 'Amer. Journ. of Med. Sc.' and in 'Trans. Pennsylvania Med. Soc.'

⁴ 'Report of the Board of Health for the State of Massachusetts for 1880,' Boston, 1881, ciii.

tain that there are no differences in the frequency of cancer at the various places in the table. That sceptical position will be seen to be the less warranted when we keep in mind the experiences with regard to cancer that have been published for other parts of the world besides the above-named localities within the temperate zone.

In the *Faröe Islands*, Panum¹ saw no case of cancer, nor could he hear of any. In a mortality-table for *Iceland*, giving the deaths among a population of about 50,000 during ten years, there are thirty-seven fatal cases of cancer entered, giving an annual death-rate from that disease of 0.07 per 10,000; again, among 2600 cases of sickness in the lists of the district medical officers, we find thirteen entries of cancer; of 327 cases under treatment by Schleisner,² there were two cases of cancer of the lip and four cases of mammary or uterine cancer; lastly, Finsen³ designates the disease as rare in Iceland. In *Greenland* it is uncommon, to say the least; Lange⁴ saw no case of it, nor could the district surgeons recall any cases that they had ever seen.

In *Turkey*, cancer of the female breast and of the uterus is so rare that Madame Messoni, as Rigler⁵ informs us, saw during nine years of extensive practice among Turkish women in Constantinople, only twenty cases of cancer of the womb and thirty-four mammary cases. The same is true of Greece,⁶ of Syria, Persia⁷ and Arabia (interior more especially).⁸ In some parts of *India* it would appear to be rather more common, there being accounts of it from Orissa,⁹ the coast-districts near Madras,¹⁰ and Cochin.¹¹ Among the natives of Anam it is seldom seen;¹² at all events less com-

¹ 'Biblioth. for Læger,' 1847, i, 311.

² 'Island undersøgt fra et lægevidenskabl. Synspunkt,' Kjöb., 1849, 27, 30, 37.

³ 'Jagttagelser angaaende Sygdomsforhold i Island,' Kjöb., 1874, 114.

⁴ 'Bemaerkn. om Gronlands Sygdomsforhold,' Kjöb., 1864, 31.

⁵ L. c., ii, 423.

⁶ Röser, 'Ueber einige Krankh. des Orients,' Augsb., 1837, 79.

⁷ Polak, 'Wien. med. Wochenschr.,' 1853, Nr. 14; 1854, Nr. 48.

⁸ Palgrave, 'l'Union méd.,' 1866, Nr. 20, 308.

⁹ Shortt, 'Ind. Annals of Med. Sc.,' 1858, July, 507.

¹⁰ Shortt, 'Madras Quart. Journ. of Med. Sc.,' 1866, July.

¹¹ Day, ib., 1862, Jan., 34.

¹² Breton, 'Considér. sur la guérison des plaies chirurg. et traumatiques chez les Annamites,' Par., 1876, 11.

monly than in *China*, Hobson's¹ experience of that country being that "cancer in various forms, but principally scirrhus or hard cancer affecting the female breast was of great occurrence."

A very decided immunity from cancer is enjoyed by the North African countries of Egypt,² Tunis,³ Algiers⁴ and Abyssinia. In the paper by MM. Rebatel and Tirant relating to Tunis we read :

"Une chose digne de remarque, c'est l'absence absolue de tumeurs malignes, cancers, cancroïdes, etc. Nous n'avons pas eu l'occasion d'en voir un seul cas, et le docteur Henry Blanc a fait absolument la même observation en Abyssinie."

Bertrand's statement as to the rarity of cancer in Algiers refers to the native population (Kabylese) : among 5561 deaths registered in Algiers from 1852 to 1854, there are 37 from cancer ;⁵ but the question remains, how many of the patients had brought the disease with them from France.

Among the negro women in Senegambia, cancer of the uterus is very unusual.⁶ By the medical authorities for the West Coast of Africa within the tropics, cancer is hardly mentioned, Clarke being the only one who speaks⁷ of it ("malignant tumours are rare" on the Gold Coast). In Frankenstein's paper⁸ relating to the Loango coast it is stated : "Of malignant tumours there occurred only two cases of cancer of the female breast. It may be, however, that patients with those diseases escape notice, as they would not be tolerated in the establishments of the white men." In *Mexico*, Jourdanet says⁹ that he met with much more cancer at the elevated places (Mexico city and Puebla) than at the level of the coast (in Campeché). In *Martinique*, Ruz,¹⁰ during twenty years of very extensive practice, saw

¹ 'Med. Times and Gaz.,' 1860, Nov., 632.

² Röser, l. c. ; Pruner, 'Krankh. des Orients,' 344.

³ Rebatel et Tirant, 'Lyon méd.,' 1874, Nr. 15, 313.

⁴ Bertrand, 'Mém. de méd. milit.,' 1867, Mars, 199.

⁵ 'Gaz. méd. d'Alger,' 1856, Janv.

⁶ Chassaniol, 'Arch. de méd. nav.,' 1865, Mai, 512.

⁷ 'Transact. of the Epidemiol. Soc.,' 1860, i, 114.

⁸ In 'Virchow's Arch.,' 1877, lxxi, 434.

⁹ 'Le Mexique et l'Amérique tropicale, &c.,' Par. 1864, 412.

¹⁰ 'Arch. de méd. nav.,' 1869, Nov., 347.

93 cases of cancer, including 31 uterine and 16 mammary. Jackson¹ says that it is of common occurrence in *Barbadoes*. For South America I know of only a few references to cancer; in the *Brazilian* province of Sta. Catharina it would appear to be common;² also in *Quito* (Ecuador), mostly uterine;³ in *Peru* the "mal de abajo" (or cancer of the womb) is prominent among the diseases of the inhabitants, but Smith thinks that the term has come to be wrongly applied, he himself having seen only one case of true uterine cancer in Lima.⁴

§ 152. MISCELLANEOUS FACTS ABOUT CANCER.

Defective as these conclusions are for the whole geographical distribution of cancer, they serve at least to make certain that *climatic influences* do not affect the frequency of the disease. There is equally little reason to bring *states of the soil* into any causal connexion with cancer. Using the official returns of the causes of death, Haviland⁵ makes out that cancer in the female sex is rarest in England on hard rock and in high-lying places, and commonest on the wet soil of river basins subject to inundations. Apart from the very questionable trustworthiness of his materials, his generalisation is opposed by the fact that, in Norway, cancer occurs mostly in the mountainous districts and at considerable elevations, to some extent, no doubt, along the shores of the fjords, but least of all on the open coast; again, in Mexico, the high table-land is more subject to cancer than the low plains.

Cancer has often been called a disease of civilisation, but that doctrine finds no support in the information before us. Against it is the fact that the number of cases is altogether independent of the density of the population; the disease is not relatively more common in large towns than in small

¹ 'Boston Med. and Surg. Journ.,' 1867, July.

² Rey, 'Arch. de méd. nav.,' 1877, Jan., 27.

³ Gayraud et Domec, 'Montpellier médical,' 1879, Janv.

⁴ 'Edinb. Med. and Surg. Journ.,' 1841, July, 177.

⁵ 'Brit. Med. Journ.,' 1870, Nov., 573.

villages, in fact it is sometimes less common; thus in the State of Massachusetts¹ on an average of nine years 5·6 per 1000 of the deaths in Boston were due to cancer, but in the small towns and country districts the ratio was 12·3 per 1000 deaths, or more than twice as much.

Lastly I have to advert to the often discussed question whether cancer has increased in recent years. Dunn² is of opinion that the question should be answered in the affirmative for England, on the evidence of the official register of deaths; and he would explain the increase, firstly by the fact that, in consequence of improved hygiene, the mortality of childhood is less, or that more people now live to grow old than formerly; and, secondly, by the greater degree and prevalence of "nervous tension" due to increased luxury, which, in his view, becomes a predisposing cause in the development of cancer. In Holland also, the number of cancer cases has increased somewhat of late; and the same can be proved for Berlin. I am not afraid of exposing myself to the charge of being too sceptical, if for the present I doubt the correctness of the conclusions drawn from the figures, and assume that the increase is merely an illusion due to improved and more comprehensive collection of the statistics of mortality. I shall mention here one fact which may serve to support my view of the matter. It is that in Frankfurt-on-the-Main, a city which has long been noted for the completeness of its population-statistics, there has not only been no increase during the last twenty-one years in the frequency of those forms of cancer which can be most accurately diagnosed during life or after death, namely mammary and uterine cancer, but indeed a considerable decrease when we allow for the fact that the population (80,000 in 1863 and 140,000 in 1883) has almost doubled during that period.

¹ Shattuck, 'Report of the Sanitary Commission of Massachusetts,' Boston, 1850, 90.

² 'Brit. Med. Journ.,' 1883, April, 708, 761.

*Deaths from Cancer of the Breast and of the Womb at
Frankfurt 1863-83.*

		Uterine.		Mammary.			Uterine.		Mammary.
1863	...	21	...	7	1874	...	16	...	9
1864	...	6	...	1	1875	...	15	...	9
1865	...	10	...	7	1876	...	14	...	12
1866	...	13	...	5	1877	...	16	...	11
1867	...	11	...	4	1878	...	20	...	11
1868	...	13	...	6	1879	...	20	...	2
1869	...	17	...	4	1880	...	16	...	6
1870	...	10	...	5	1881	...	24	...	4
1871	...	15	...	4	1882	...	21	...	7
1872	...	18	...	8	1883	...	20	...	5
1873	...	12	...	11					

CHAPTER XVII.

NEUROSES.

§ 153. VAGUENESS OF THE HISTORICAL REFERENCES.

In the province of Diseases of the Nervous System, the inquiry into history and geography encounters a good many insuperable difficulties in the defective state of the scientific materials at our service, not merely from past times but even of contemporary date. Apart from a few diseases of the central organs with very distinctive symptoms, such as hysteria, epilepsy, chorea, tetanus and tabes dorsalis, what we find in the ancient and mediæval writings upon nervous diseases, as well as in those of the modern period down to the beginning of this century, is that great aggregate of symptoms, the "dolours," "palsies," "cramps," "convulsions" and the like, behind which lie concealed all sorts of diseases of the nervous system. No criticism, how acute soever, will altogether succeed in analysing them and resolving them into their elements, so that they might be turned to account for the purposes of historical pathology. Almost as scanty are the materials furnished by medico-topographical writings of recent date for the elucidation of the subject in hand from the point of view of geographical distribution. In those parts of the world, more especially, where scientific medicine has not hitherto obtained currency except to a small extent, and where the study of the circumstances of disease is beset with peculiar difficulties special to the locality and of a kind that will be readily understood, there are but few observers who have directed their inquiries upon the question of nervous diseases and their several types. The more unusual forms of sickness have entirely escaped their notice; and even in the case of those maladies that

are more frequently met with, the observers have mostly confined themselves to brief notes, some at least of which bear upon the face of them the marks of untrustworthiness. But in those very countries where scientific medicine has its proper seats and has been diligently cultivated on this particular side, the topographical records of disease furnish but meagre materials for the study of nervous diseases as they fall to be considered in this work. Most of all do we feel the want of statistics; for, in the majority of the tables of mortality, these diseases are either entered as causes of death under one class, or they figure as palsies, apoplexies and the like; while the hospital lists of admissions and deaths are entirely valueless for our purpose.

For these reasons, accordingly, I have to content myself with a somewhat incomplete account of this group of maladies. I have included only a small number of the forms of disease belonging thereto, giving a preference to those that occur in epidemics or endemics and have something of the character of diseases of the people. Even within those narrow limits there are some for which I have been unable to do more than present a few generalities as to their occurrence in time and place, together with any elucidation that the etiology may receive therefrom.

1. *Neuralgia.*

§ 154. REFERENCES TO NEURALGIA IN OLD WRITINGS.

Of the *history of neuralgia*¹ in antiquity, as well as during the middle ages and down to about the middle of last century, the medical writings of those times give us no means of forming an adequate judgment. Neuralgia as a specific affection of one or other of the sensory nerves is an idea that would have been unintelligible to them; it was rather with diseased states of the joints, bones or muscles that they associated the painful feelings of neuralgia. No doubt

¹ See Bretschneider, 'Versuch einer Begründung der Pathologie und Therapie der äusseren Neuralgien,' Jena, 1847, Seite 2 ff.

we encounter in the writings of the better sort of practitioners of each of those periods, such as Aretaeus,¹ Avicenna,² Abulcasim,³ Fernel,⁴ Riolan⁵ and Rivière,⁶ descriptions of diseases that can be applied without constraint to various forms of neuralgia, especially the facial and sciatic; and therein we may find evidence that it existed at least in those times, and probably that it was not less common than at present.

The earliest account of face-ache which correctly indicates it as an affection of a definite nerve of sensation, we owe to André,⁷ who was the first to give it the name of "tic douloureux." Then came in succession the writings of Cotugno⁸ on sciatic neuralgia, of Fothergill⁹ on facial neuralgia; and at length the excellent work of Chaussier¹⁰ (1803), who was the first to develop a definite notion of neuralgia, grouping the various forms of it that occur in the organism according to anatomical plan, sketching the most important symptoms, and thereby laying a foundation for this chapter of the diseases of the nervous system.

§ 155. GEOGRAPHICAL DISTRIBUTION OF NEURALGIA.

Our knowledge of the present *geographical distribution* of neuralgias, like that of their history, is merely fragmentary. From the northernmost latitudes of Europe we have information by Finsen¹¹ of their comparative frequency in *Iceland*.

¹ 'De causis et sign. diurn. morbor.,' lib. i, cap. ii, ed. Kühn, 68.

² 'Canon,' lib. iii, fen. 2, tract. 1, cap. 15.

³ 'Chirurgia,' lib. i, sect. 6, ed. Channing, Oxon., 1778, i, 25.

⁴ 'Universa medicina,' lib. vi, cap. 18, Freft., 1607, 634.

⁵ 'Encheiridium anat. et pathol.,' lib. 5, cap. 46, Lugd. Batav., 1649, 407.

⁶ 'Observat. med. et curationum,' Centur. i, Nr. 4, Centur. ii, Nr. 25, Delphis, 1651, 5, 134.

⁷ 'Observations sur les maladies de l'urèthre et sur plusieurs faits convulsifs,' Par., 1756, 318.

⁸ 'Comment. de ischiade nervoso,' Neapol., 1764.

⁹ 'Med. Observ. and Inquiries,' Lond., 1772, vol. v, 129.

¹⁰ 'Table synoptique de la neuralgie suivant la nomenclature méthodique de l'anatomie,' Par., 1803.

¹¹ 'Jagttagelser angaaende Sygdomsforholdene i Island,' Kjöbenhavn, 1874, p. 119. Finsen refers to a peculiar nervous malady endemic in Iceland, and known there under the name of "nálarðofi," or loss of feeling in the hand. Schleisner had already called attention to it ('Island undersøgt fra et lægevidenskabeligt Syn-

In the *Scandinavian* countries, in the *British Islands* and in *Germany*, they count among the maladies of common occurrence; and that holds also as a general thing for *Belgium*, *France* and *Italy*. Doubtless among the several regions or localities of these great tracts of country there are more or less considerable differences in the frequency of the ailment, although the writings at our service give but very scanty information concerning them.

Thus Jefferey¹ states that sciatica and brow-ague were very rarely seen at Sidmouth; and Otto² remarks upon the infrequency of neuralgias, face-aches especially, at Copenhagen. On the other hand, Sovet³ emphasises the remarkably common occurrence of neuralgias in the canton of Beauraing (prov. Namur), Cabrol⁴ its prevalence on Belle-Isle-en-mer, and Briard⁵ the same in Ancona.

From Asiatic countries we have accounts of the frequency of neuralgias in *Arabia* by Palgrave,⁶ at many parts of *India* (north-western regions of the Deccan,⁷ Nilghiri Hills,⁸ Coromandel coast, the Ceded Districts⁹ between Hyderabad and Mysore, and Pondicherry),¹⁰ in the *Malay Archipelago*,¹¹ *Cochin China*,¹² *China*¹³ and *Japan*.¹⁴ From Polynesia we hear of neuralgia being a common complaint in *Tahiti*,¹⁵ whereas it

spunkt,' Kjöbenh., 1849, p. 24). It shows itself by pricking or shooting pains beginning in the fingers and hand, often extending up the forearm and even to the shoulder, and usually accompanied by a deadening of the sensibility, which may go on to complete anæsthesia. Finsen is inclined to attribute the most frequent occasion of this malady in women—of 33 cases seen by him, 24 were in women, 7 in men, and 2 in children—to the ewe-milking.

¹ 'Transact. of the Prov. Med. and Surg. Assoc.,' 1843, xi, 214.

² *Ib.*, 1837, vii, 25.

³ 'Annal. de la soc. de méd. d'Anvers,' 1840, 71.

⁴ 'Mém. de méd. milit.,' 1851, ii, sér. vi, 51.

⁵ 'Trav. de la soc. de méd. de Dijon,' 1842, 122.

⁶ 'Union méd.,' 1866, Nr. 20, i, 308.

⁷ Gibson, 'Transact. of the Med. Phys. Soc. of Bombay,' 1838, ii, 210.

⁸ Mackey, 'Madras Quart. Journ. of Med. Sc.,' 1861, July, 29.

⁹ Eyre, *ib.*, 1860, Oct., 338.

¹⁰ Huillet, 'Arch. de méd. nav.,' 1868, Févr., 63; Auboeuf, 'Contribut. à l'étude de l'hygiène et des malad. dans l'Inde,' Par., 1882, 60.

¹¹ Heymann, 'Darstell. der Krankh. in den Tropenländern,' Würzb., 1855; account in 'Arch. de méd. nav.,' 1867, Septbr., 172.

¹² au Japon, &c., Montp., 1868.

¹³ Berl., 1878, 175.

is rarely seen in New Caledonia and the New Hebrides.¹ In Africa the chief localities of it that we hear of are the strip of *Abyssinia*² bordering the Red Sea, and *Senegambia*.³ Clot-Bey⁴ and Pruner⁵ are agreed as to its rarity in Egypt. In the *United States*, according to Murray's⁶ view, neuralgias are commoner than in the corresponding latitudes of the Eastern Hemisphere; and that opinion has lately been confirmed for the territories of Dakota and Montana by Harvey,⁷ who says that neuralgia is seen there unusually often.

From *Mexico* there are accounts of the prevalence of the malady on the Anahuac or high plateau;⁸ also from *Panama*⁹ and *Costa Rica*.¹⁰ In the West Indies it is said to be frequently seen in Martinique¹¹ and Guadeloupe.¹² Lastly neuralgias are very widely diffused and very common in the *States of the River Plate*,¹³ in *Chili*¹⁴ (Valparaiso and other places), and in *Peru*.¹⁵

§ 156. INFLUENCE OF SEASON AND WEATHER.

Neuralgia may be the effect of organic changes in sensory nerves, or of localised irritation of the nerves by morbid conditions in their vicinity; or it may be a toxic symptom, or a result of a central lesion, or, most frequently of all, the out-

¹ de Rochas, 'Topogr. hyg. et méd. de la Nouvelle-Calédonie,' Par., 1860, 33; Boyer, 'Arch. de méd. nav.,' 1878, Sept., 224.

² Courbon, 'Observ. topogr. et méd., &c.,' Par., 1861, 38.

³ Borius, 'Arch. de méd. nav.,' 1882, Mai, 370.

⁴ 'Aperçu gén. sur l'Egypte, &c.,' ii, 319.

⁵ 'Krankh. des Orients,' Erlang., 1846, 301, 303.

⁶ 'Essay on Neuralgia,' New York, 1816.

⁷ 'New York Med. Record,' 1879, April, 345.

⁸ Newton, 'Med. Topogr. of the City of Mexico,' New York, 1848; Jourdainet,

'Le Mexique et l'Amérique tropicale,' Par., 1864, 407.

⁹ Lidell, 'New York Journ. of Med.,' 1852, July, 91.

¹⁰ Schwalbe, 'Arch. für klin. Med.,' 1875, xv, 340.

¹¹ Rufz, 'Arch. de méd. nav.,' 1869, Octbr., 256.

¹² Carpentin, *ib.*, 1873, Decbr., 448.

¹³ Mantegazza, 'Lettere med. sulla America meridionale,' Milano, 1860-1863, i, 121, ii, 210; Dupont, 'Note et observ. sur la côte orient. d'Amérique,' Montp., 1868, 17.

¹⁴ Account in 'Arch. de méd. nav.,' 1864, Août, 107.

¹⁵ Tschudi, 'Oesterr. med. Wochenschr.,' 1846, 475.

come of a constitutional state dependent on influences from without and ultimately traceable to the circumstances of the locality or of the season, including climate, weather and soil. Unfortunately our knowledge of the geographical distribution of the neuralgias is too defective to let us decide with certainty how far influences of the latter kind may determine the prevalence of the malady at various parts of the world. We can merely allege as a general rule that, if neuralgia do occur in every region of the globe, it is most commonly met with in tropical and subtropical countries. *Climatic conditions*, accordingly, would be not unimportant; while it further appears from several of the authorities above quoted for India, Abyssinia, Tahiti, and the western territories of the United States, that the localities most subject to the malady are those that are characterised by severe and abrupt changes of temperature with moisture, being for the same reason particularly subject to rheumatism. It is noteworthy also that, as neuralgias of the rheumatic kind are, along with other rheumatic disorders, commonest within the temperate zone in the cold and wet seasons of the year,¹ in tropical countries they reach their maximum when the rains begin and when they cease, or in the seasons corresponding to our spring and autumn.

§ 157. CONNEXION WITH MALARIA.

A second factor determining the occurrence of neuralgia has to be looked for in those *states of soil* which are favorable to *malaria*. Brow-ague has been found to be somewhat common in the malarious regions within higher latitudes; and its prevalence in Minorca,² Panama (Lidell), some parts of the Deccan (Gibson), and in other tropical or subtropical countries, has also been traced to malaria. It is a noteworthy fact that Egypt and New Caledonia, which are remarkable for their relative or absolute immunity from

¹ Valleix ('*Traité des neuralgies*,' Paris, 1841), the
² two-thirds of the cases, occurred within

malarial fevers and for the steadiness of their climate and weather, are strikingly free from neuralgia.

§ 158. NO RACIAL PREDISPOSITION.

There is no agreement among observers as to any predisposition towards neuralgia among the various *races*. According to Heymann and v. Leent it is least common in the East Indies among negroes, and not so common among the Malays as among the Europeans. Huillet also has seen more of it in Europeans than in the coloured races. On the other hand, according to Carpentin, the natives in Guadeloupe are as subject to it as the Europeans; and it would seem to follow from what Borius writes of Senegambia, that there is no real difference between the white race and the coloured as regards the liability to neuralgia.

2. *Hysteria*.

§ 159. THE OLD VIEWS OF HYSTERIA AND THE MODERN.

Among the neuroses of the central organs, hysteria comes first as estimated by frequency and generality of diffusion at all times and in all parts of the world. We can follow the *history of the disease* far beyond the Christian era. In the very oldest Brahminical writings on medicine there is mention of it among the diseases of the nervous system.¹ We find it described under the names *πνιξ ὑστερική* and *ἀπνοία ὑστερική* in the writings of the Greek physicians,² who looked

¹ Wise, 'Commentary on the Hindu System of Medicine,' Lond., 1860, 250. The malady is there spoken of under the name of "gluma."

² Thus, in the pseudo-Hippocratic treatise, probably of the school of Cnidos, 'De morbis mulierum,' lib. i, cap. 7, and lib. ii, cap. 123—127, 151—152 (in 'Hippokrat. Opp.,' ed. Littré, viii, 32, 266, 326); Celsus, lib. iv, cap. 20; Aretaeus, 'De causis et signis acut. morb.,' lib. ii, cap. xi; Galenos, 'De locis affect.,' lib. vi, cap. v, and 'De compos. medicament. secund. locos,' lib. ix, cap. 1 (very full description in both passages); also in 'Hipp. Libr. de humoribus, Comment.' i, cap. xix, ed. Kühn, viii, 413, xiii, 319, xvi, 177; Aëtius, lib. xvi, cap. lxx—lxxiii, ed. Basil, 1535, iii, 151; Paulus, lib. iii, cap. lxxi, ed. Basil, 1551, 286 u. a.

upon it as the effect of cramp-like contraction of the uterus, or of displacement of the uterus (wandering of that organ within the body even as high as the neck, in order to account, it would seem, for the *globus hystericus*); or as a result of *δυσκρασία* due to the retention of the male seed or of the menstrual blood ("ob retenta menstrua vel semen cohibitum," as Galen says); or of some other putrescent matter within the womb (Paulus), being in that view a malady pertaining exclusively to the female sex—as Galen says, *γυναικες ὑστερικαί*. We find the same views held by the Arabian writers¹ and the authors of the mediæval compendiums of medicine,² in their very full descriptions of hysteria under the name of "suffocatio matricis." The great length at which the disease is discussed by the ancient and mediæval writers leaves us in no doubt as to its general prevalence in those periods. In like manner for the practitioners of the sixteenth and seventeenth centuries, hysteria was a stock subject in their compendiums and in special monographs on diseases of women, as well as a favourite topic for dissertations and other academical essays of the time; in these also we find the same view of hysteria as in the writers of antiquity and the middle ages, the notion of it, namely, which is implied in the names "spasmi matricis" or "suffocatio" or "præfocatio" or "strangulatio," as well as "passio hystERICA," under which they described it.

The first to speak of hysteria as a malady of the nervous system was Piso (or Lepois).³ In the course of analysing a case of epilepsy, he takes occasion to discuss the relation of that disease to hysteria, declaring that both of them proceed from affection of the brain; the uterine origin of hysteria, he says, is a contention maintained "*ridiculé et absurdé*,"

¹ Avicenna, 'Canon,' lib. iii, fen. xi, tract iv, cap. 16—19, ed. Venet., 1564, i, 942; Haly Abbas, 'Lib. theoric,' ix, cap. 38, 'Lib. pract.,' viii, cap. 12, ed. Lugd., 1523, 120, 264.

² See the following, belonging to the school of Salerno: Platearius, "Pract. de egritud. matricis," cap. iii (in 'Practica Serapionis,' Lugd., 1525, fol. 22), and in "De aegritud. curat. tract. ex schola Salernitana," in de Renzi, 'Collect. Salernit.,' ii, 338; Valescus de Tharanta, 'Philonium,' lib. vi, cap. xiii, Lugd., 1490, fol. 282; Gordon, 'Lilium med.,' Particula vii, cap. x, Lugd., 1574, 621; Savonarola, 'Practica,' tract. vi, cap. xxi, Venet., 1497, fol. 248 b.

³ "Selectior. observ. et consilior. de prætervisis hactenus morbis singularis," Sect. ii, Pars. ii, cap. vii, viii, Lugd. Batav., 1714, ***—187

the more so that men also are subject to it. To the same effect is the teaching of Willis:¹ "*Affectio hysterica ad cerebrum et nervosum genus praecipue spectat.*" Sydenham² also, who considered hysteria to be the most widely diffused and frequent of chronic diseases,³ says that, although it was commonest in women, yet it was sometimes seen in men; and accordingly that uterine troubles could not be the real cause of it, but that we should have to look for its source in an affection of the nervous system. Hoffmann⁴ defines hysteria as "*affectus generis nervosi spasmodico-convulsivus, ex utero a lympa et sanguine in ejus vasis retento vel corrupto proveniens, et per nervos ossis sacri, ac lumbares et totam medullam spinalem, universi corporis partes nervosas plus minus infestans;*" thus correctly recognising its nervous character. In indicating its origin, however, he reverts to the views of the old Greek writers, more particularly to Paulus; and the justice of that compromise was afterwards vindicated by Whytt,⁵ who declared that hysteria was certainly dependent often on uterine disorder, but that it might occur independently of the latter, and that it really proceeded from "a too great delicacy and sensibility of the whole nervous system."

§ 160. GEOGRAPHICAL DISTRIBUTION OF HYSTERIA.

These references to hysteria, coming from various parts of Europe and Asia, and descending to us from remote antiquity, serve to show that the malady had been widely

¹ '*Pathologia cerebri,*' cap. x, Amstelod., 1682, 68, and in his letter to Higmore upon "*affectiones quae dicuntur hystericæ et hypochondriacæ pathologia spasmodica.*"

² '*Diss. epistolar. ad Guill. Cole,*' Opp., Genev., 1736, i, 256.

³ "*Hic morbus,*" says Sydenham, "*si recte calculum pono, chronicorum omnium frequentissime occurrit.*"

⁴ '*Med. ration. system.,*' tom. iv, pars iii, sect. i, cap. v, Opp., Genev., 1748, iii, 50; also in '*Diss. sistens compend. et clin. spasmodico-convulsivorum morbor. praxis,*' Hal., 1707, in Opp. Suppl., ii, pars. ii, 201, and '*Diss. de morbi hystericæ vera indole, &c.,*' Hal., 1733.

⁵ "*On the Nature, Cause and Treatment of the Disease commonly called Nervous Hypochondriasis or Hysteria,*' chapter ii. In his collected works, Edin., 1768 (German ed., p. 306, Leipzig, 1771).

diffused and of common occurrence; and the writings on medical geography of the present century, applying to nearly every part of the world, give no less decided evidence of hysteria having the same range of extent in modern times.

One of the principal seats of the malady is the group of countries in the *Arctic latitudes* of the Eastern Hemisphere, including *Iceland*,¹ the *Farøe Islands*,² *Lapland*,³ and the parts of European and Asiatic *Russia* in the extreme north. From the last of these we have information of the truly endemic prevalence of hysteria among the women of the *Samojeds* (government of Archangel⁴) and of the *Jakutes* and other Siberian tribes, as well as among the inhabitants of *Kamschatka*.⁵ This Russian prevalence extends also to the more southern latitudes; thus, hysteria is unusually common among the women of the *Baltic Provinces*,⁶ and among those of *Viatka*,⁷ *Simbrisk*, *Samara*⁸ and the *Kirghiz Steppes*.⁹ In the countries of *Central Europe* hysteria, it is well known, counts among the commoner maladies; but it is a good deal more frequent in the southern parts of the Continent, such as the south of *Spain* and *Italy*. Of the latter *Frank*¹⁰ wrote: "*Quamvis spasmi (scil. hysterici) nec in regionibus septentrionalibus desiderentur, eos tamen longe frequentius in Italia obvenire, meae docent observationes;*" and we have details from *Venice*,¹¹ *Rome* and *Civita Vecchia*,¹²

¹ Holland, 'Edinb. Med. and Surg. Journ.,' 1812, Apr., 205; Schleisner, l. c., 27; Finsen, l. c., 124.

² Martins, 'Revue méd.,' 1844, Févr.; Panum, 'Bibl. for Laeger,' 1847, i, 279.

³ Hoguér, 'Reise durch Lapland,' Berl., 1841, 114; Castrén, 'Reisen im Norden,' from the Swedish, Lpzg., 1853, 151.

⁴ Schrenck, 'Reise durch die Tundren der Samojeden,' Dorpat, 1848, i, 70.

⁵ Gebler, 'Annal. der Heilkst. für das Jahr 1813,' 330; Erman, 'Reise um die Erde u. s. w.,' Berl., 1848, iii, 190.

⁶ Baer, 'Diss. de morbis inter Esthones endemicis,' Dorp., 1814; Moritz, 'Spec. topogr. med. Dorpatensis,' Dorp., 1823.

⁷ Jonin, 'Med. Ztg. Russl.,' 1849, Nr. 45.

⁸ Ucke, 'Das Klima und die Krankh. der Stadt Samara,' Berl., 1863, 221.

⁹ Maydell, 'Nonnulla topogr. med. Orenburg. spectantia,' Dorp., 1849.

¹⁰ Faure, 'Souvenirs du Midi.'

¹¹ 'Prax. med. univ. praecepta,' part. ii, vol. i, sect. ii, Lips., 1821, 558, note 11.

¹² Taussig, 'Venedig von Seiten seiner klimat. Verhältnisse,' Vened., 1847, 69.

¹³ Bérard, 'Journ. des connoiss. méd.-chir.,' 1847, Nov., 200; Jacquot, 'Gaz. méd. de Paris,' 1853, Nr. 34.

Reggio¹ and other places; also from *Turkey*,² where, as Oppenheim says,³ it is "the heritage of women and the scourge of men;" also from the *Ionian Islands*, Hennen's⁴ statement for Ithaca being:

"A very common complaint among these people is hysterics, which appear in an infinite variety of shapes, often producing such extravagant gestures, as to make the ignorant believe the patient possessed of the devil. In these cases, the priest is called to frighten the demons, and to send them to their lurking places."

We have only a few notices of hysteria in *Asia*. Among the vigorous peoples of the interior of *Asia Minor* it is hardly known;⁵ on the other hand Tobler⁶ says that it is unusually common among the female population of Jerusalem. Among European women resident in *India*, according to Macpherson,⁷ Day,⁸ Aubouf⁹ and others, it is as common as in Central Europe; but they assert (and Twining¹⁰ agrees with them) that it is absolutely rare among Hindu women. The same may be said to be true of the Anamese women, for Beaufile¹¹ did not see a single case of hysteria among them during a residence of several years in Cochin China. I shall afterwards refer to its occurrence among Malay women in the *East Indies*, particularly in Java. We have no information about it from Australia; it is almost unknown among the natives of New Zealand,¹² but is not unfrequently seen in *Tahiti* and other islands of *Polynesia*.¹³

Coming to African territory, we find references to its unusually common occurrence among the native population of

¹ Manemi, 'Filiatre Sebezio,' 1842, Novembre.

² Rigler, 'Die Türkei, &c.,' ii, 342.

³ 'Ueber den Zustand der Heilkde. und der Volkskr. in der Türkei,' Hamb. 1833, 64.

⁴ 'Sketches of the Med. Topogr. of the Mediterranean, &c.,' Lond., 1830, 413.

⁵ West, 'New York Med. Record,' 1869, March, 28.

⁶ 'Beitr. zur med. Topogr. von Jerusalem,' Berl., 1855, 41.

⁷ 'Indian Annals of Med. Sc.,' 1858, Jan., 236.

⁸ 'Madras Quart. Journ. of Med. Sc.,' 1862, Jan., 34.

⁹ 'Contributions à l'étude de l'hyg. et des maladies dans l'Inde,' Par., 1882, 62.

¹⁰ 'Clinical Illust. of the more important Diseases of Bengal,' Calcutta, 1835, ii, 437.

¹¹ 'Arch. de méd. nav.,' 1882, Avril, 259.

¹² Thomson, 'Brit. and Foreign Med.-Chir. Rev.,' 1854, Octbr.

¹³ Wilson, 'Edinb. Med. and Surg. Journ.,' 1806, July, 287.

Mauritius,¹ and among Hottentot women at the *Cape*; according to Dr. Roser, who practised in Gnadenthal, there are few Hottentot women living there who do not suffer from hysteria in one form or another.² The same is true of the women of *Madagascar*; of whom more in the sequel. Courbon³ speaks of its great frequency in the *Abyssinian* territory bordering the Red Sea; Pruner,⁴ Vauvray⁵ and Pissas⁶ give the same account of it in *Egypt*, just as Ferrini⁷ and Rabatel⁸ do for *Tunis*. In *Senegambia* also it is not altogether rare;⁹ nor would it seem to be unknown in the *Western Soudan*, Ballay¹⁰ having seen several cases of it in native women during a short stay at Ogooué.

For the Western Hemisphere, there is an account by Gras¹¹ of its exceptional frequency in Miquelon (*Newfoundland*). It is very prevalent among women of the upper classes in the *United States*, particularly in the Southern States. On the tableland of *Mexico*, hysteria counts among the commonest of diseases,¹² and it is frequent in *Costa Rica*,¹³ among the creole women of the *West Indies*,¹⁴ in *Brazil*,¹⁵ in all parts of the *River Plate States*¹⁶ (Santa Fé, Entre Rios, Corrientes, Salta), and in *Chili*¹⁷ and *Peru*.¹⁸

¹ Chapotin, 'Topogr. méd. de l'Ile-de-France,' Par., 1812, 101.

² According to the statement of Scherzer, 'Ztschr. der Wien. Aerzte,' 1858, 165.

³ 'Observat. topogr. et méd., &c.,' Par., 1861, 38.

⁴ 'Krankh. des Orients,' 280.

⁵ 'Arch. de méd. nav.,' 1873, Septbr.

⁶ Pissas, 'Congrès des médecins Grecs, &c.,' Constantinople, 1883, 21.

⁷ 'Saggio sul clima di Tunisi,' Milano, 1860, 179.

⁸ 'Lyon médical,' 1874, xvi, 312.

⁹ Chassaniol, 'Arch. de méd. nav.,' 1865, Mai, 508; Rey, ib., 1877, Juin; Borius, ib., 1882, Mai, 370.

¹⁰ 'L'Ogooué: L'Afrique équator. occidentale,' Par., 1880, 41.

¹¹ 'Quelques mots sur Miquelon,' Montp., 1867, 34.

¹² Jourdanet, l. c., 408.

¹³ Schwalbe, l. c.

¹⁴ Savaresy, 'De la fièvre jaune,' Napl., 1809, 88.

¹⁵ Sigaud, l. c., 354.

¹⁶ Mantegazza, l. c., i, 19; ii, 286. He makes special mention of the excessive amount of hysteria among the native Indian women (Abipones).

¹⁷ Gillies, in 'U. S. Naval Astron. Expedition' (abstract in 'Dtseb. Klin.,' 1856, Nr. 34); Piderit, ib., 1853, N. 48.

¹⁸ 'Oesterr. med. Wochenschr.,' 1846, 475; Smith, 'Edinb. Med. and Surg. J.,' Oct., p. 393.

§ 161. RELATION TO SEX, RACE AND OTHER CIRCUMSTANCES.

There is nothing in the history and geographical distribution of hysteria to warrant the assumption that the origin of the malady is directly under the influence of *climatic* or *telluric conditions*. It may be said to be the teaching of experience that a certain physical and psychical disposition of the individual constitution, almost peculiar to the *female sex* and revealing itself in a *highly wrought susceptibility to excitation*, is an essential basis of the disease; and that every thing which tends to intensify that physiological disposition or to disturb still further the balance of activity in the nervous centres, including both psychical influences, which would give a perverse turn in one direction or another to the mental activity, and affections of the body, which lower the power of resistance, and most of all, in the female sex, maladies of the generative organs and the after effects of these—that everything of that kind is an occasion for the central neurosis to arise. This neurosis, often accompanied as it is by psychical disturbance, presses close upon the confines of the psychoses proper. There is no doubt that it has played a great part in the history of witchcraft, of animal magnetism, somnambulism, spiritism, hypnotism, the epidemic psychopathies so-called, and demoniacal manias; and it is perhaps playing its part anew in the “Salvation Army.” We shall not err, therefore, if we ascribe the more or less frequent occurrence of hysteria in various parts of the world mostly to such influences as serve to give a certain direction to the natural development of the mental and bodily powers, particularly those of women. Again, the degree of immunity from hysteria enjoyed by certain races and nationalities (referred to here and there in the foregoing sketch), would have to be explained, not by their physiological peculiarities, but in the first instance by their whole manner of life. We may apply to all families of mankind, *mutatis mutandis*, what Rigler says of the negro race: “The reason why negroes suffer less from hysteria than white women is not anything more favorable *a priori* in their organisation; it is rather that their inferior position makes labour and active

exercise incumbent upon them and so makes them hardy. If they led the same soft life as other city dames, their nerves would play them the same tricks as in women of a white skin."

§ 162. RELIGIOUS HYSTERICAL OUTBREAKS.

There can be no doubt, in my opinion, that all these so-called "epidemic psychopathies" are not an affair of mental disease in the strict meaning of the term, but of accesses of ecstasy resting essentially on a hysterical basis. They are called forth by various causes, but most of all by religious enthusiasm (*Schwärmerei*); and they have found a fruitful soil wherein to grow, in the imitative instincts of a great multitude when spiritually moved. At the same time they have held out to imposture and other low motives a convenient handle by which to work their purpose; but it would be just as perverse to ascribe these psychical and physical manifestations absolutely and wholesale to imposture, as to ignore the existence of that factor altogether. It is beyond my purpose to give a history of these psychopathic epidemics; and I shall limit myself to bringing forward a few of the more recent and more interesting observations of the kind, which are likely to shed some light on the nature of these abnormal activities in the spiritual life of man.

It is easy to understand why abnormalities of that kind should have assumed much larger proportions in former ages, dominated as they were by all kinds of superstition—by devils, demons, and witches—than in the modern period, illuminated as it is, if not everywhere penetrated, by the light of reason. Such manifestations as the dancing frenzy and the children's crusades in mediæval Germany, as well as the tarantismi of Italy in the fifteenth—seventeenth centuries, were only possible at a time when not merely the masses, but even the more intelligent and better educated classes were profoundly steeped in a sort of mysticism which gave itself up to subjective impressions without tracing them to their source, and called in the aid of supernatural powers whenever a scanty acquaintance with the powers of

nature failed to furnish an explanation; a time also when the Church did not scruple to stir up religious fanaticism and bigotry for its own purposes, and to encourage them so long as it could keep them under its own control. But the same phenomena, less broadly characterised, are encountered in epidemics and endemics of the present day, the devil and the evil spirits being altered, indeed, to suit contemporary taste, but still playing their part not less really in the production of such hysterical exhibitions.

In Hecker's classical work, and in the well-known treatise of Calmail (edited in German by Leubuscher) we have a full collection of observations of that kind in so far as concerns the middle ages and the modern period down to the end of last century. By far the most of these, it is well known, had their root in religious enthusiasm or ecstasy.

To these we have to add the psychopathy that has been prevalent in Sweden among the sect of the "Läsare" (literally "gleaners"), having been set on foot by fanatical preachers. Its first considerable diffusion was from 1668 to 1673 in the northern parts of the country (Lappmarken). In 1841-42 there was a visitation of it in the central part of Sweden around Lake Wener; in 1854 it was in the district of Nedercalix (Norbottenlän), again in 1858 in several localities of Dalarne (particularly Falun and Rättvik), and once more in 1866-68, but to a less extent, at a few places in various parts of the country. The affection was known by the name of "Predikosjukan" (the preaching disease), or "Blåkullafärderne" (trips to the Brocken). It took the form of paroxysms, which affected at the outset a few persons, mostly women, during the exercises of religion. They threw themselves on the ground with the most marvellous contortions, uttering inarticulate cries and howls; or they assumed the part of inspired preachers, apostrophising those near them in nonsensical language, interlarded with references to the devil and hell and eternal damnation, and intended to bring contrition and submissiveness to the heart. The easily excited crowd were soon drawn into the same kind of ecstasy, which sometimes went the length of coarse excesses, the apostles of the sect permitting their mission to become a prey to immoral designs. One development of that kind, which

has been popular with false saints under other circumstances, was the practice of naked dances at the meetings of the converted.¹

The psychical outbreaks that have often occurred in the sects of the Methodists in England and America were of the same nature. Such was that of the "jumpers," which made so much stir in Cornwall in 1760;² they reappeared there in 1812 (especially at Redruth, Camborne and other places near) and drew many thousands into their delusions.³ Under another name ("revivals") they again held their wild orgies in Cornwall in 1859, and at the same time in Belfast.⁴ Methodist evangelising carried these extravagances to a frightful extent in the United States in 1798-1805; they spread like a pestilence from Ohio through Tennessee, Virginia, Kentucky and the Carolinas, affecting hundreds of thousands; the victims were known by various names, according to the form that their enthusiasm took, some being called "barkers," because they emitted bellowing noises like dogs, while others went through a pantomime performance called "the jerks," which, according to contemporary descriptions,⁵ outdid everything that can be conceived or believed.⁶ The "revivals" already mentioned as having occurred in England were imported from America.

The village of Morzine in the arrondissement of Thonon (Dept. Haute-Savoie) was the scene of a hysterical outbreak of the religious kind in 1857, following the harangues of a mission-preacher and a series of church services with which the unsophisticated and superstitious villagers were plied, to the extent of eight or ten hours' devotion a day.⁷ The first persons affected were girls, who became subject to convulsive seizures, screamed and jumped about, expressed the most immoral desires, and not unfrequently had real outbursts of

¹ Wrotholm, 'Ztschr. für Psychiatrie,' 1854, xi, 125; 'Sundhets-Collegii Berättelse,' 1855, 8; 1858, 83; 1867, 35; 1868, 40.

² Evans, 'Sketch of the Denominations of the Christian World,' Lond., 1814, 236.

³ Cornish, 'London Med. and Phys. Journ.,' 1814, xxxi, 373.

⁴ Account in 'Edinb. Med. Journ.,' 1860, Jan., 654.

⁵ Davidson, 'History of the Presbyterian Church of Kentucky.'

⁶ The most recent accounts are by Sutton, 'Transact. of the Amer. Med. Assoc.,' 1858, xi, 47; and by Yandell, 'Brain,' 1881, Oct., 339.

⁷ Constans, 'Relation sur une épidémie d'hystéro-démence gâllie,' Par., 1862; Kuhn, 'Gaz. méd. de Lyon,' abstracted in 'Brit. Med. Journ.,' 1864, 20, Aug.

mania. Later on the psychical disorder spread to hundreds of persons, but it was mostly confined to girls and young married women; in the end even children were excited to the same kind of excesses, clearly by imitation. The spiritual poison introduced among that unhappy population continued to be active for several years; so that Constans, when he visited the village in the spring of 1861, found sixty-four persons still possessed, most of them being girls from sixteen to twenty-two years of age.

On a minor scale and of smaller extent were the following pscopathies of that sort: in 1808, in the prefecture of Bohnhorst (province of Stolzenau in Hanover), among school-girls from nine to fourteen years old;¹ in 1847, at the maison-de-refuge "du Bon-Pasteur" at Amiens, where there were twenty cases of catalepsy among the ninety penitents as well as two cases among the twelve nuns of the house;² in 1850 in an unsophisticated and superstitious village of Baden, where a hysterical girl fell down in a rigid fit at a funeral and thereafter a considerable number of children, mostly about thirteen years old, were seized with ecstatic paroxysms, the general conviction being that they were possessed of the devil;³ in 1854 at Niederreggenen (department of Mühlheim, Baden), in the form of "preaching disorder" among a good many girls of ten to thirteen years of age;⁴ and at the orphanage of Elberfeld⁵ under the same circumstances, in the notorious "revival" form.

Of particular interest are those hysterical psycho-pathological conditions, springing out of religious enthusiasm or superstitions about the devil, which have been endemic mostly in the colder or in the more tropical countries, and among populations whose moral or intellectual backwardness has been quite especially favorable to mental aberrations of that sort in persons of a suitable disposition. A hysterical pscopathy of that kind, prevalent among the Samoeds

¹ Albers, in 'Hufeland's Journ. der pract. Arzneikde.,' 1813, April, xix^o, Hft. 4, S. 3.

² Andrieu, 'Gaz. méd. de Paris,' 1847, 970.

³ Schlatter, 'Ztschr. für Psychiatr.,' 1852, ix, 604.

⁴ Rees, ib., 1856, xiii, 445.

⁵ Velthusen, ib., 1862, xix, 275.

under the name of "ikota," is thus described by Schrenk:¹ The disease occurs almost exclusively among married women, being very general among them; but only exceptionally among men. It is to be reckoned as one of the manifold varieties of hysteria. In its milder form the disease shows itself in inarticulate sounds which the affected person gives forth whenever her eye encounters anything repugnant to her, or if she be teased about any such susceptibility; when the malady is more intensely developed, the woman breaks out into mania, throws her arms about her or even turns her fury on her own person, resuming the appearance of perfect sanity when the paroxysm is over. The cause of the malady is generally considered by the people to be that the person is bewitched, or under the influence of wicked men in league with the devil. Much imposture, however, as the author assures us, is practised in this way by "depraved" women. A disease resembling this "ikota" is found, according to Guttceit,² in the governments of Kursk and Orel; it attacks only the older or younger wives and elderly unmarried women, and is described by that author as an epileptiform hysteria. The subjects of it are called "klikuschi," *i. e.* "screaming women possessed;" the attacks usually come on at religious services, or in circumstances calculated to excite paroxysms in nervous and hysterical persons. At one time these have the type of hysteria, at another time rather of epilepsy, and sometimes a character bordering on mania; they last usually for a short time only, but they may go on for a whole day or longer in a succession of paroxysms. It has been proved that, in this disease also, impostures occur, as well as seizures with undoubted nervous phenomena. It further appears from a paper by Ucke³ that these "screaming women" are not rare in the government of Samara; there also, as the authority says, the seizures occur for the most part in considerable assemblies, at church or similar occasions, and the popular belief is that the affected persons are "bewitched." There is an account by

¹ 'Reise durch die Tundren der Samoeden,' i; also in 'Med. Ztg. Russl.,' 1850, 16.

² *Ib.*, 1851, 246.

³ *L. c.*, 221.

Hibbert¹ of the endemic occurrence of religious ecstatic seizures in the form of hysterical paroxysms among the women of the Shetland Isles. Also in the religion of Islam, according to Lambuco,² there are observed among certain sects (Naxi-Bendi, Rafais and others) the same sort of nervous exaltations and neuropathic paroxysms in the form of screaming, convulsive quaking and shaking, epileptiform rigidity and so on, just as already described for Christian sects. Among the so-called demoniacal psychopathies, the malady which Pearce³ describes as occurring in Abyssinia under the name of "tigretier," has its place; and although Courbon⁴ declares the stories about "tigretier" to be fables, he remarks that severe forms of hysteria are common among the women in Abyssinia, and that they find expression in strange mental delusions. Among hysterical native women in Java, both of the higher and lower social ranks, there occurs a paroxysmal psychical disorder, which takes the form of rapid ejaculation of inarticulate sounds, and of a succession of involuntary movements (which others are led to imitate), and of temporary loss of consciousness, the mental powers remaining quite intact except during the paroxysm. There is no doubt that the seizure is often simulated; although, in the very tendency to mimic, there is some morbid disposition of the nervous system implied, except in those cases where the dissembler can secure some advantage to herself by her fraud. The disease is known in Java under the Malay name of "lata."⁵

Much interest attaches to the epidemic choreomania that was seen in Madagascar in the years 1863-64; it occurred almost exclusively among women of the lowest classes, mostly girls and married women from fifteen to twenty-five years of age; and it vividly recalled the dancing madness of the middle ages. The occasion of the outbreak of this psychopathy, which began at one point and spread gradually over the whole island, was the profound sensation caused among

¹ 'Description of the Shetland Islands, &c.,' Edinb., 1822, 399.

² 'Progrès médical,' 1884, Nr. 39, 774.

³ 'The Life and Adventures of Nathaniel Pearce, written by himself, during a residence in Abyssinia from the year 1810 to 1819,' Lond., 1831, i, 290.

⁴ L. c., 39.

⁵ Heymann, l. c., p. 172; van Leent, 'Arch. de méd. nav.,' 1867, Sept., p. 172.

the people by the violent death of the king Radama II, and the consequent changes in the religion and laws. The commotion proceeded from the opponents of Christianity and of European polity; these were the only persons involved in it, the Christians declaring the episode to be the work of the devil. The morbid phenomena were absolutely identical with those of the dancing mania.¹

The peculiar and characteristic thing in these and all previous psychopathies of the kind, is, firstly, that they implicated the female sex either exclusively or at all events quite especially; secondly, that profound commotion of the spiritual life, mostly in the sphere of religion, was the chief cause of the phenomena being manifested in one degree or another, and all the more intensely where ignorance and superstition made the emotions susceptible of influences of that sort and facilitated a disturbance of equilibrium in the nervous system, whether physical or psychical; thirdly, that the psychical seizures and other kinds of nervous affection associated therewith, were clearly transmissible by way of imitation to wider circles from those first attacked; fourthly, that the area and intensity of type of the morbid process were reinforced by unintentional hysterical imitation, or, in other words, by the morbid craving of the hysterical for attracting attention and interest; and, lastly, that the unworthiest and foulest motives came to dominate the movement and to turn it to account for their own purposes, so that imposture has played no small part therein.²

¹ There are accounts of it by Davidson, 'Edin. Med. Journ.,' 1867, Aug., p. 124; and Borchgrevink, 'Norsk Mag. for Lægevidensk.,' 1872, p. 241.

² The account of the "revivals" in Ireland in 1859 contains the following: "A respectable paper in the North of Ireland gave certain statistical statements, purporting to prove that the cases of crime and drunkenness brought before the magistrates of Belfast were more numerous during the four months while the movement was in active operation than in two equal periods before that time."

3. *Hallucinations of the Desert.*

§ 163. GENERAL ACCOUNT OF "LE RAGLE."

Under the above name, the traveller d'Escayrac de Lauture¹ gave an account some thirty years ago of a kind of transient illusion of the senses, peculiar both in its origin and in its type, which happens not unfrequently to travellers in the desert, especially to such as are in a state of general enfeeblement from antecedent sickness, or from extreme fatigue, or want of food, or it may be even from depressing emotions such as anxiety, terror and the like.

These hallucinations are mostly of the sense of sight, more rarely of hearing, occasionally of smell and taste, and sometimes even, it would seem, of common sensation; and they vary much in type, not only in different persons, but also in their successive occurrences in the same person. Whoever becomes the subject of them sees in the stones lying in his path either great rocks or buildings, or the footprints of animals; the wheel track changes before his eyes into cultivated fields or meadows; a piece of level ground in the shadow, especially under moonlight, is taken for an abyss, or a ravine, or a spring of water; long trains of camels or waggons rise up before him, or files of soldiers whose very uniform he thinks he can recognise. At another time he seems to be surrounded by extremely slim trees of immense height, whose foliage shuts out the sky overhead, while it does not screen the stars. Sometimes these objects seem to the victim of illusion to be so near that he thinks to put his hand on them; at other times he sees them far in the distance, and changing their forms according as he looks with open or half-closed eyes. Less frequent than these hallucinations of sight, are illusions of hearing; and the latter are particularly common with those whose ears had been stupefied by the roaring of violent desert-winds, or irritated by the sand, or who may be subject to noises in the ears. As in the case of the illusions of sight, the sensory impressions are confused and falsified, so that all kinds of phantasmagorias arise; the rustling of the herbage, the noise of a stone striking the ground, the sighing of the wind, turn to a favourite air, a cry of distress, the report of a gun, and so on.

Usually the hallucinations occur in the hours between midnight and six or seven in the morning, vanishing at daybreak. If they come on during the day they are especially dreaded, because then they attack only those who are in a state of extreme exhaustion. Each hallucina-

¹ 'Mémoire sur "le ragle," ou hallucination du désert,' Paris, 1855.

tion, which will probably have had a sudden onset, lasts a few minutes at least; it then vanishes as swiftly as it came, and the traveller is just as little able to assign any reason for its going, as he was unable to prevent its coming. The one certain means of bringing these recurrent onsets to an end is sleep; even if it last only for a few minutes, it always brings decided relief.

Escayrac compares the disease, but I think not quite appositely, with the effects of spirits, opium or haschisch, or with the delirium of fever or other hallucinations of that kind. It would seem to be rather an affair of inanition.

4. *Chorea.*

§ 164. CONFUSION OF NAMES SUBSEQUENT TO SYDENHAM.

The name of St. Vitus' dance (*Chorea Sancti Viti*) was originally given to a hysterical psychopathy which appeared in the fourteenth and fifteenth centuries in some parts of western Germany in the form of the dancing mania (*Tanzwuth*, choreomania); it is still commemorated in the grotesque "procession of the jumping saints" which is held every Whitsuntide at Echternach (Luxemburg). The same word (*chorea*) was subsequently used by Sydenham to designate the spasmodic malady which is now universally known under that name; and from that time a distinction began to be made between a "chorea Germanorum" (the "greater" St. Vitus' dance, or choreomania) and a "chorea Anglorum" (the "lesser" St. Vitus' dance, or neurosis of the central organs characterised by incoherent action of the muscles). Great as are the merits of Sydenham's classical description¹ of this disease, which was quite unknown before him or confounded with other spasmodic diseases; still his choice of a name for the malady that he described has had a confusing effect on the views of his successors, who have been led by the community of terms to infer the identity of the two processes, or to see merely differences in degree between them, and have moreover brought other diseases marked by spasmodic phenomena

¹ In 'Shedula monitor. de novae febris ingressu,' Op. Genev., 1736, i, 360, and *Processus integri in morbis curandis*, Op., i, 506.

into their definition of "chorea," and thereby increased the confusion. It is only of recent years that the subject has been cleared up; we are now convinced that "chorea Germanorum" and "chorea Anglorum" have nothing in common; and the term "chorea," very unsuitable though it be, has been again restricted to the sense in which Sydenham used it in his original description.

Of the *history of chorea* in the period before Sydenham we have no means of judging, for the reason that the earlier writings do not contain a single unambiguous reference to the malady.¹ On the other hand, the numerous monographs and papers in journals by German, English, French and United States practitioners of the eighteenth century warrant us in concluding that chorea was a comparatively frequent object of clinical observation in that period; although it is impossible to make out whether there were any considerable differences in the number of cases in the various localities.

§ 165. GEOGRAPHICAL DISTRIBUTION.

Of the present *geographical distribution* of chorea, we can merely infer from the medico-topographical records before us that no part of the world is altogether free from the disease, and that it would seem to occur rather more frequently in some regions than in others. It stands to reason that the scanty statistics of hospitals or of the private practice of a few physicians are not sufficient to enable us to draw safe conclusions regarding frequency; we must therefore be content for the present with a few generalities, which are not all equally trustworthy.

¹ It appears to me to be very questionable whether Galen's definition of *κελευροβη* can be taken as relating to chorea. I believe we should be much nearer the mark in associating it with *tabes dorsalis* (see vol. ii, p. 510). There is more reason in taking the disease described in *Susruta* under the name of "*kalāskhanja*" as pointing to chorea. Wise, in his '*System of Hindu Medicine*' (Lond., 1860, p. 254), says: "The disease is characterized by the person feeling in the commencement a trembling or shivering sensation through his body . . . these symptoms are followed by involuntary twitching of the head, neck and jaw, often of one side, especially of one leg. The patient speaks indistinctly, and then the involuntary motions extend to the whole voluntary muscles of progression, producing a dancing motion."

That there are on the whole no considerable differences noticeable in the diffusion of the disease within the *temperate zone of Europe and America*¹ appears to be undoubted. In the countries of Southern Europe, also, the malady would appear to be not altogether rare, according to Faure's² information for *Spain* and Rigler's³ for *Turkey*. From subtropical and tropical latitudes we have information about chorea in *Arabia*, where Palgrave⁴ saw several cases of it; in *Madagascar*, where it is very common according to Borchgrevink;⁵ in *Egypt*, where Pruner⁶ had seen cases although only in strangers; in *Algiers*,⁷ among the Arab population; in *Senegambia*,⁸ also among the natives; and among the same class in the western *Soudan*⁹ and on the *Gold Coast*.¹⁰ For *India* I know of only one notice, by Auboeuf,¹¹ who saw no more than one case of chorea during a somewhat long residence at Pondicherry. In China it is said (doubtfully) to be quite unknown.¹² It appears also to be very rare in the *West Indies*, at all events only one case occurred in the practice of Rufz¹³ in Martinique during twenty years; Dareste, who practised thirty years in the same island, saw nothing of it either in the coloured race or in the white; and Rochoux gives the same account for Guadeloupe. There is no information about chorea from the equatorial regions of the Western Hemisphere; but it is spoken of as somewhat frequent on the table-land of *Mexico*.¹⁴

¹ Taylor, 'Philadelphia Journ. of Med. and Phys. Sc.,' 1826, May, xii, 80, where he says of chorea: "Our own country presents us with a vast field for its ravages."

² 'Souvenirs du Midi, &c.'

³ 'Die Türkei und deren Bewohner, &c.,' ii, 291.

⁴ 'Union med.,' 1866, 308.

⁵ 'Norsk Magaz. for Laegevidensk.,' 1872, 241.

⁶ 'Krankh. des Orients,' 303.

⁷ Bertherand, 'Médecine et hygiène des Arabes,' Par., 1855.

⁸ Borius, 'Arch. de méd. nav.,' 1882, Mai, 370.

⁹ Ballay, 'L'Ogooué,' &c., Par., 1880, 41.

¹⁰ 'Transact. of the Epidemiol. Soc.,' 1862, i, 114.

¹¹ 'Contributions à l'étude de l'hyg. et des maladies dans l'Inde,' Par., 1882, 60. See also the reference to Susrata on p. 532 (note).

¹² Dudgeon, 'Glasgow Med. Journ.,' 1877, July, 331.

¹³ 'Arch. gén. de méd.,' 1834, Febr., 215; 'Arch. de méd. nav.,' 1869, Oct., 260.

¹⁴ Newton, 'Med. Topogr. of the City of Mexico,' New York, 1848; Jourdanet, 'Le Mexique, &c.,' Par., 1864, 411.

§ 166. INFLUENCE OF CLIMATE AND SEASON ; EPIDEMICS THROUGH MIMICRY.

Whether the occurrence of chorea is in any way dependent on climate cannot be decided owing to the scantiness of our information ; but, so far as we know, it would appear that no climate enjoys an immunity from the disease. In like manner the statistics are too meagre to warrant us in drawing any conclusion as to the influence which *season* and *weather* exert on the pathogenesis.¹ It lies outside the limits of my subject to consider the special incidence of chorea upon the age of childhood, or the period of ripening ; and upon the female sex ; as well as the relationship between chorea and *rheumatic fever*, a subject which had attracted the attention of writers as early as Stahl² and Uwins.³ The doctrine that the disease is propagated by way of heredity is to be understood in the sense that a nervous system congenitally prone to morbid excitation, being a legacy from neurotic parents, predisposes the children to chorea. (An instance is known to me of an epileptic father who has two children subject to chorea.)

Not unfrequently the disease spreads by way of *mimicry*. Small epidemics, even, have been seen to arise under that influence in various kinds of institutions for girls ; one person with chorea having been admitted, the malady has quickly extended to the larger part of the inmates. Cases of that sort are referred to by an anonymous reviewer of Bedingfield's 'Compendium of Medical Practice' as follows:⁴ "We have seen chorea become very frequent in a seminary for the education of girls, by imitation ; and its progress checked by separation." Bricheteau⁵ observed an epidemic outbreak of chorea in a ward of the Hôpital Necker among

¹ Lebert ('Handb. der pract. med.,' Tübingen, 1859, ii, 529) denies, according to his own experience, that there is any such influence. [The connexion between chorea and the season is stated in a more affirmative sense by Weir Mitchell, 'Lectures on Diseases of the Nervous System,' 2nd ed., 1885.]

² 'Ratio medendi,' iv, 78.

³ 'Edinb. Med. and Surg. Journ.,' 1812, Oct., 408.

⁴ 'Ibid.,' 1816, Oct., 491.

⁵ 'Arch. gén. de méd.,' 1863, Avril, 433 ; Mai, 532.

young girls; a child subject to the disease having been admitted, nine others out of the twenty-eight inmates of the ward were seized with it.¹ Perhaps we should include here also Bouzol's observation² of an epidemic of hysteria with choreiform phenomena, which happened in a factory at Albon (Ardèche); nearly the whole of the girls employed in it were attacked, and in some of them the seizure was complicated with hypnotism.

5. *Epilepsy.*

§. 167. GEOGRAPHICAL DISTRIBUTION.

Of all the diseases included in the group of neuroses, none shows a prevalence so general in time and place as epilepsy; none is so constant a presence in the morbid life of humanity; none has so markedly the ubiquitous character. In all the medical writings of antiquity reference is made to this disease, usually at great length;³ it is a stock subject, and not less elaborately treated, in the Arabian compendiums⁴ and in those of mediæval Western practitioners;⁵ in the

¹ 'Lyon médical,' 1884, No. 40—42.

² The statement of Mullin ('Edin. Med. and Surg. Journ.,' 1805, Jan., i, 31) that there had been an epidemic of that kind in the orphanage of Milan is based upon a paper of Moscati; the disease, however, was not chorea but ergotism. See vol. ii, 215, and Table, p. 208 (anno 1795).

³ See the post-Aristotelian treatise, 'De morbo sacro,' in the *Collectio Hippocratica* (ed. Littré, vi, 352); also 'Aphorism.,' sect. ii, § 45, 57 (e. c. iv, 482, 534), and 'Prædicta,' lib. ii, § 9, 10 (e. c. ix, 28); Celsus, lib. iii, cap. 23 (ed. Basil., 1556, 62); the classical descriptions of epilepsy by Aretæus, 'Morb. chron.,' lib. i, cap. 4 (ed. Kühn, Lips., 1828, 72), and Cælius Aurelianus (or Soranus), 'Morb. chron.,' lib. i, cap. 4 (ed. Amstelod., 1755, 291); Galen, 'De locis affectis,' lib. iii, cap. ix, seq. (ed. Kühn, viii, 173—at p. 194 the "aura epileptica"), and 'Comment. in Hipp. Epid.,' vi, cap. vii (e. c. xvii, B, 341); Oribasius, 'Synopsis,' viii, cap. 3, 4; Aëtius, lib. vi, cap. 12—21 (ed. Basil, 1535, 246); Alexander Trall., lib. i, cap. 15 (ed. Basil, 1556, 62), and Paulus, lib. iii, cap. 13 (Basil, 1551, 148).

⁴ Rhazes, 'De re medica,' lib. ix, cap. 11 (Basil, 1544, 219); Haly Abbas, 'Practica,' lib. v, cap. 21 (Lugd., 1523, fol. 215 b.); Avicenna, 'Canon,' lib. iii, fen. i, tract. v, cap. 8—10 (Venet., 1564, i, 484, seq.).

⁵ Belonging to the school of Salerno we find Gariopontus, 'De corpor. egritud.,' lib. i, cap. 6 (Basil, 1531, 5), and "De egritudin. curatione," lib. ii, in de Renzi's

medical literature of the sixteenth to eighteenth century, which is exceedingly rich in monographs and articles upon epilepsy, we begin to find evidence of the existence of the disease in all countries where medical science had gained a footing; while of recent years our topographical information about disease furnishes evidence in fullest measure that epilepsy is universally prevalent all over the world.

At many places in Arctic latitudes epilepsy is very common: as in *Greenland*,¹ *Iceland*,² the northern parts of *Sweden* and *Norway*,³ *Russia-in-Europe* (*Livonia*⁴ and *Courland*), and *Siberia*.⁵ Again, it is far from rare among the Kirghiz inhabiting the steppes of Southern Russia.⁶

"There are few countries," says Lichtenstein,⁷ "in which epilepsy is commoner or of more various types than in Courland; among the Letts it is particularly common." In like manner Frank⁸ says: "Nullibi, ni fallor, querelæ hujusmodi [frequency of epilepsy] majore jure institui possunt quam in Russia septentrionali, in Curlandia et in Polonia." In some districts of Sweden, such as Schonen and parts of Småland, the disease has almost an endemic character;⁹ in the latter province, more particularly in some villages of Jönköpingslään, a remarkable increase in the number of epileptic cases has been noticed of late.¹⁰

* Collect. Salernit., Napol., 1853, ii, 111. The following are among the writers of the 13th—15th centuries, who speak of it: Arnaldus Villanovanus, 'Breviar.' lib. i, cap. 22 (Opp. Basil, 1585, 1071); Gordon, "Lilium medicum," 'De passionibus capitis,' part ii, cap. 25 (Lugd., 1574, 227); Gaddesden, "Rosa anglica," Aug. Vindel, 1595, 33; Guilelmus de Saliceto, 'Summa conservationis,' lib. i, cap. 15 (Venet., 1502, fol. 14 b); Varignana, 'Secreta,' tract. ii, cap. 4 (Lugd., 1526, fol. 7 b); Bertuccio, 'Collector,' sect. i, tract. i, cap. 8 (Lugd., 1509, fol. 31); Valescus de Tharanta, 'Philonium,' Lugd., 1490, fol. 25; Guainerio, 'De egritud. capitis,' tract. vii, cap. 1 (Lugd., 1534, fol. 17 b); Savonarola, 'Practica,' Tract. iv, cap. 1, rubr. 20 (Venet., 1497, fol. 65 b); Montagnana, 'Consilia,' xliii—xlv (Venet., 1497, fol. 70 b, seq.); Mattheo Ferrario (de Gradi), 'Practica,' "De egritud. cerebri," cap. 8 (Venet., 1508, fol. 42 b).

¹ Cranz, 'Historie von Grönland,' Barby, 1770, i, 189; Lange, 'Bemærkn. om Grönlands Sygdomsforhold,' Kjöbenh., 1864, 42.

² Holland, 'Edinb. Med. and Surg. Journ.,' 1862, Apr., 205; Schleisner, 'Island, &c.,' 27.

³ Pontoppidan, 'Historie von Norwegen,' from the Danish, Copenh., 1754, 487.

⁴ Moritz, 'Spec. topogr. med. Dorpatensis,' Dorp., 1823.

⁵ Gebler, 'Annal. der Heilkst. f. d. Jahr 1813,' 330.

⁶ Maydell, 'Nonnulla topogr. med. Orenburg. spect.,' Dorp., 1849.

⁷ In 'Hufeland's Journ.,' 1819, Aug., xlix, Heft. 2, 77.

⁸ 'Prax. med. univ. praecept.,' part. ii, vol. i, sect. ii, 307.

⁹ Linné, 'Abhandl. der schwed. Akad.,' 1750, iv, 309.

¹⁰ Huss, 'Om Sverges endemiska sjukdomar,' Stockh., 1852, 64.

For *Central and Southern Europe* an approximate estimate would put the average frequency of the disease at about 1 or 1.5 per 1000 inhabitants. From the military conscription-lists of several European powers we obtain statistical data that are in some degree serviceable. In *France* the number of conscripts sent back on account of epilepsy from 1831 to 1853 was 6627 in a total of 4,036,372, or 1.6 per 1000.¹ From 1850 to 1869, according to Chervin, the proportion among French conscripts was 2.75 per 1000.² In *Italy*, out of 2,333,288 persons medically inspected in fifteen years, 5103, or 2.4 per 1000, were dismissed as unfit for service on account of epilepsy or other convulsive disease;³ but in that country, as in France, there are considerable differences between the several provinces. In *Belgium* the number of conscripts examined medically in five years (1851-55) was 201,790; and of these 189, or 0.9 per 1000, were rejected for epilepsy.⁴ In five superior districts of *Württemberg*, with a population of 131,000, there were 122 epileptics, giving a ratio of 0.93 per 1000.⁵

The following lists show the differences in the amount of the disease in the several provinces of France and Italy:

Epilepsy in the French Departments.

0.5—1.0 per 1000.—Puy-de-Dôme, Manche, Haute-Vienne, Loiret, Seine-Marne, Yonne, Tarn-Garonne, Aude, Indre, Rhône, Meurthe, Côte-d'Or, Doubs, Deux-Sèvres, Finistère.

1.1—1.5 per 1000.—Ain, Bas-Rhin, Vosges, Calvados, Lot, Ardennes, Jura, Cantal, Tarn, Saône-Loire, Moselle, Charente, Hautes-Alpes, Orne, Charente infér., Eure, Côtes-du-Nord, Garde, Ardèche, Loire, Seine, Creuse, Haut-Rhin, Cher, Dordogne, Corse, Aisne, Allier.

1.6—2.0 per 1000.—Pas-de-Calais, Nord, Basses-Alpes, Aveyron, Gironde, Vaucluse, Nièvre, Maine-Loire, Haute-Saône, Vienne, Ile-Vilaine, Seine-Oise, Oise, Lot-Garonne, Eure-Loire, Drôme, Indre-Loire, Hautes-Pyrénées, Loir-Cher, Hérault, Landes, Isère.

2.1—3.4 per 1000.—Gers, Morbihan, Sarthe, Haute-Marne, Haute-

¹ Boudin, *Traité de géogr. et statist. méd.*, Par., 1857, ii, 449.

² These figures may very well depend, not on a real increase in the number of inspection.

³ *Id.*, Roma, 1881, 255.

⁴ *Id.*, Bruxelles, 1865, 101, tab.

⁵ *Id.*, Nr. 6—10.

Loire, Var, Somme, Haute-Garonne, Mayenne, Vendée, Marne, Basses-Pyrénées, Bouches-du-Rhône, Arriège, Loire infér., Seine infér., Lozère, Aube, Corrèze, Meuse, Pyrénées orient.

Cases of Epilepsy per 1000 Italian Conscripts in the several Provinces.

Liguria..... 5.1	Calabria ... 2.7	Marches ... 2.1	Venetia..... 1.6
Sicily 4.8	Sardinia ... 2.7	Campania... 2.1	Apulia 1.5
Tuscany ... 3.2	Emilia 2.4	Basilicata... 1.9	Rome..... 1.4
Umbria..... 2.8	Lombardy.. 2.2	Abruzzi..... 1.6	Piedmont.. 1.3

The differences within French territory do not follow the larger geographical divisions; but in Italy we find as a general rule that the disease predominates in the southern and western provinces in contrast to the north-eastern.

From tropical and subtropical regions of *Asia* we have information of epilepsy being common in *Asia Minor*,¹ *Syria*,² many parts of *India*,³ *Ceylon*,⁴ the *East Indies*⁵ and *China*.⁶ It is proved also, by accounts from *Tahiti*⁷ and *New Caledonia*,⁸ that the Pacific is not exempt.

From *African* territory we have information of the occurrence of epilepsy in *Madagascar*,⁹ in *Abyssinia* (where it is known as "bouda" or "the bewitcher"),¹⁰ in *Egypt*,¹¹ *Tunis*,¹² *Algiers*,¹³ *Senegambia*,¹⁴ the *Greater Soudan*,¹⁵ the *Gold Coast*,

¹ West, 'New York Med. Record,' 1869, March, 27.

² Pruner, 'Krankh. des Orients,' 303.

³ Geddes, 'Clin. Illustr. of the Diseases of India,' Lond., 1846, 243; Shortt, 'Indian Annals of Med. Sc.,' 1852, July, 506; Huillet, 'Arch. de méd. nav.,' 1868, Févr., 83; Thorel; Beaufls, *ibid.*, 1882, April, 259 (Cochin China).

⁴ Thomson, 'Brit. and For. Med.-Chir. Rev.,' 1854, Oct.

⁵ Heymann, 'Krankh. in den Tropenländern,' 174.

⁶ Friedel, 'Klima und Krankh. Ost-Asiens,' 91.

⁷ Wilson, 'Edinb. Med. and Surg. Journ.,' 1806, July, 287; Schwarz, 'Zischr. der Wiener Aerzte,' 1859, 537.

⁸ Boyer, 'Arch. de méd. nav.,' 1872, Sept., 224.

⁹ Borchgrevink, 'Norsk Magaz. for Laegevidensk.,' 1872, 241.

¹⁰ Courbon, 'Notes,' 38.

¹¹ Pruner, l. c.; Pissas, 'Congrès des médecins Grecs, &c.,' Constantinople, 1883, 21.

¹² Ferrini, 'Saggio sul clima . . di Tunisi, &c.,' Milano, 1860, 180.

¹³ Bertherand, 'Médecine et hyg. des Arabes,' Par., 1855; Delcau, *Mém. de méd. milit.*, 1842, lii, 230; Challan, 'Gaz. méd. d'Algérie,' 1868, Feuille, 118.

¹⁴ Chassaniol, 'Arch. de méd. nav.,' 1865, Mai, 508; Borius, *ib.*, 1882, Mai, 370.

¹⁵ Ballay, 'L'Ogooné, &c.,' Par., 1880, 41.

Sierra Leone,¹ and *Madeira*.² From the *Western Hemisphere* there are accounts of it in the *West Indies*,³ on the table-land of *Mexico*,⁴ on the coast of *Peru*,⁵ and more particularly in *Brazil*,⁶ where epilepsy is so common that Rendu includes it among the diseases that are universally prevalent.

§. 168. UNINFLUENCED BY CLIMATE.

The foregoing facts serve to show that epilepsy is in no-wise influenced, in respect of its geographical distribution and relative frequency, by conditions of *climate* and *soil*. The opinion which has been several times put forward, that the disease is much more often met with in cold or temperate latitudes than in tropical or subtropical countries, has been overthrown by the observations on the striking frequency of epilepsy in India, Senegambia, the West Indies, Lima, and Brazil. Again, the distribution of the disease in France, where according to the figures quoted, the maxima of 1·8 to 3·4 per 1000 fall chiefly on those departments that belong, by their elevation, to the alpine or sub-alpine region, and the prevalence of epilepsy in Mexico at elevations of 1000 to 2000 metres, are facts that make against Lombard's⁷ doctrine of the malady being rare in mountainous regions at elevations of 2000 metres or less.

¹ Clarke, 'Transact. of the Epidemiol. Soc.,' 1862, i, 114.

² Kämpfer, 'Hamb. Ztschr. für Med.,' 1847, xxxiv, 159; Mittermaier, 'Madeira und seine Bedeutung als Heilungsort,' Heidelb., 1853.

³ Ruz, 'Arch. de méd. nav.,' 1869, Oct., 258.

⁴ Newton, 'Med. Topogr. of the City of Mexico,' New York, 1848; Jourdanet,

'Le Mexique, &c.,' 411.

⁵ Smith, 'Edinb. Med. and Surg. Journ.,' 1841, Oct., 395.

⁶ Sigaud, 'Du climat et des malad. du Brésil,' Par., 1844, 355; Rendu,

'Études topogr. et méd. sur le Brésil,' Par., 1848, 83.

⁷ 'Des climats de montagne considérés au point de vue medical,' Geneva, 1856, p. 25.

§ 169. FAVOURING CONDITIONS.

It is well known that *drunkenness* plays a leading part in the production of epilepsy. One proof of this of a geographical kind, we may find in the fact that formerly, when it was the custom among the British troops in India to drink hard, delirium tremens and epilepsy were heavy items in the sick lists. But the most important cause is *hereditary transmission*, the significance of which has been done full justice to by the ancient and mediæval practitioners.¹ Peculiarities of *race* and *nation* have no influence whatsoever on the occurrence of epilepsy; it is of the same type and equally common among all the nationalities of Europe, in the Moorish population of Algiers, among the black race on the West Coast of Africa, among the Mongols of Northern and Southern Asia, among Malays, Javanese, natives of Peru, and Indians of Brazil. Whether the natives of New Zealand do enjoy an absolute immunity from epilepsy, as Thomson says they do, is questionable; I do not know of any more recent information on the point; but even if it be so, the reason of it, as Thomson himself admits, is not to be looked for in any constitution of body due to racial peculiarities of the Maori.

It will be convenient to take here what has to be said of

Apoplexy.

§ 170. VAGUE CONNOTATIONS OF NAME IN FORMER TIMES.

The hindrances to the historical and geographical study of nervous diseases, which were stated at the beginning of this chapter, are felt most of all in the inquiries as to the distribution of apoplexy in time and place. That the disease had occurred in all periods of the history of mankind may

See the post-Hippocratic treatise, 'De morbo sacro,' § 2, ed. Littré vi, 364 and Rhazes, 'De morbis infantum,' lib. 1, cap. vii, Opp. Basil, 1544, 511.

be granted *a priori*, and it can be proved, moreover, from the medical writings of every age. But it is impossible to answer the question whether the malady has been more frequent in one period than another, for the reason that the term "apoplexy" has included at one time more than at another as medicine has developed, and has been used in a wider or narrower sense. That holds good even for the most recent writings on the topography of disease, and for the statistics of sickness and death; so that it is impossible to give anything like a trustworthy answer to the question, in what parts of the world and to what extent the accident is apt to occur at the present time. Despite this defectiveness or very limited trustworthiness of the materials at our service for making the inquiry, I have thought it right not to pass the matter over in absolute silence; although I state the results of my inquiries more for the purpose of eliciting new facts under the same heads, than with any hope of being able to come to conclusions of any importance concerning the geographical area of the disease, or its dependence upon exterior circumstances.

§ 171. COMMONEST IN THE TEMPERATE ZONE.

I know of only two references to apoplexy in the northernmost latitudes of either hemisphere; according to one of these, apoplexy is the most common cause of death among the aged in the island of Miquelon (*Newfoundland*);¹ according to the other, it is so rare in *Iceland* that Finsen² saw only two cases of it during a practice of ten years. The following figures, which may be used with some reserve, show the comparative frequency of apoplexy in Central and Southern Europe:

¹ Gras, 'Quelques mots sur Miquelon,' Montp., 1867, p. 39.

² 'Jagttagelser, &c.,' p. 117.

Percentages of Deaths from Apoplexy in the Total Mortality.

Place.	Years of observation.	Percentage of deaths.	Place.	Years of observation.	Percentage of deaths.
Copenhagen ¹ ...	11	1·16	Holland ⁹	1	0·82
Königsberg ² ...	6	1·11	Brussels ¹⁰	19	0·90
Danzig ²	6	1·30	England ¹¹	10	1·30
Hamburg ³	9	0·95	Venice ¹²	10	1·11
Berlin ⁴	5	0·80	Turin ¹²	10	1·61
Breslau ⁵	6	1·50	Genoa ¹²	10	0·84
Hanover ⁵	6	0·92	Bologna ¹²	10	1·36
Cologne ⁵	6	1·53	Rome ¹²	10	1·75
Frankfurt-o.-M. ⁶	19	0·81	Naples ¹²	10	1·17
Grand Duchy of			Messina ¹²	10	0·70
Hesse ⁷	2	0·60	Spain ¹³	1	1·21
Stuttgart ⁸	8	0·70	Malta ¹⁴	11	1·18

The differences among the above figures, which are sometimes considerable, are undoubtedly owing to the fact that "sudden deaths from internal cause" are included by some statisticians under the head of apoplexy, and by others excluded therefrom or placed under other heads, such as "congestion of the brain" or "convulsions" (particularly in children).¹⁵ As a matter of fact, there can hardly be any

¹ Tables of mortality in 'Bibl. for Laeger' and 'Sundhedskoll. Forhol.,' 1849 to 1860.

² 'Berichte des Königl. Preuss. statist. Bureaus,' 1875-80.

³ 'Berichte des Hamb. Gesundheits-Amtes,' 1873-81.

⁴ 'Berliner statist. Jahrbuch,' 1877-81.

⁵ Same authority as in note 2.

⁶ 'Statist. Mittheilungen über den Civilstand der Stadt Frankfurt,' 1863-81.

⁷ 'Beiträge zur Medicinal-Statistik des Grossherz. Hessen,' 1877, 1878.

⁸ 'Württemb. med. Correspdzbl.,' 1873-80.

⁹ 'Nederl. Tijdschr. voor Geneesk,' 1881, and Nr. 36, 1879.

¹⁰ Janssens, in 'Bullet. de l'Acad. de méd. de Belgique,' 1862-80.

¹¹ Registrar-General's Reports.

¹² Sormani, 'Geogr. nosol. d'Italia,' Roma, 1881, 262.

¹³ Id., 263.

¹⁴ Tulloch, 'Statist. Reports, &c.,' Lond., 1839, 69.

¹⁵ I give the following illustration in proof of this: The report of the Royal Bureau of Statistics puts the deaths from apoplexy at Berlin in 1877 at 1021, and those at Frankfurt-o.-M. from 1875 to 1880 at 701; but the former appear in the 'Berlin Statistical Year-Book' as 751, and the latter in the statistical reports from Frankfurt as 519.

considerable differences in the number of cases between north and south, such as are shown by the figures for Berlin and Frankfurt on the one hand, and for Genoa and Messina on the other. Even in subtropical latitudes apoplexy would appear to be not altogether rare, according to observations from *Egypt*,¹ *Madeira*,² the *Cape*,³ *New Orleans*⁴ and the *Mexican plateau*.⁵ On the other hand the tropics enjoy an exemption which, if not absolute, is at any rate very remarkable. According to Dutroulau's⁶ experience, apoplexy is very rare in Senegambia, Cayenne, the West Indies and other countries in low latitudes, particularly so among the coloured races and the acclimatised Europeans; and that opinion finds support in the accounts by Thevenot⁷ for Senegambia and by Forström⁸ and Ruz⁹ for the West Indies. There have been contrary experiences in Sierra Leone (Clarke¹⁰), in Upper Sind (Campbell¹¹), in Ceylon (Thomson¹²), in Brazil (Pleasant¹³), on the Peruvian coast (Smith¹⁴) and in Tahiti (Schwarz¹⁵); but these serve only to prove, as already remarked, that the exemption of the tropics is not an absolute one; and moreover they must be taken with a certain reserve, for the reason that heat-stroke has often been confused with apoplexy, especially in the tropics.¹⁶

¹ Pruner, 'Krankh. des Orients,' p. 274; Pissas, l. c., p. 21.

² Kämpfer, l. c., 159.

³ Schwarz, 'Ztschr. der Wien. Aerzte,' 1858, 630.

⁴ Stark, 'Edin. Med. and Surg. Journ.,' 1851, Jan., 130.

⁵ Jourdanet, l. c., 408.

⁶ 'Traité des malad. des Européens dans les pays chauds,' Par., 1861, 12, 35, 100.

⁷ 'Traité, &c.,' Par., 1840, 243.

⁸ 'Svensk. Läk. Sällsk.,' Hdl., iv, 231.

⁹ 'Arch. de méd. nav.,' 1869, Oct.

¹⁰ 'Transact. of the Epidemiol. Soc.,' 1862, i, 114.

¹¹ 'Med. Times,' 1851, Febr., 147.

¹² 'Brit. and For. Med.-Chir. Rev.,' 1854, Oct.

¹³ 'Amer. Journ. of Med. Sc.,' 1842, July, 88.

¹⁴ 'Edinb. Med. and Surg. Journ.,' 1841, Oct., 393.

¹⁵ 'Ztschr. der Wiener Aerzte,' 1859, 537.

¹⁶ Morehead ('Clinical Researches of Disease in India,' Lond., 1856, ii, 577) says with reference to "apoplexy" in Bombay: "The term apoplexy . . . in hospital returns is sometimes used to designate sudden coma, caused by general cerebral sanguineous determination, with or without serous effusion . . . excited by elevated temperature or alcoholic excess." Most of the cases of "apoplexy" which he saw in the European and native hospitals of Bombay were really cases

§ 172. FAVOURING CONDITIONS.

The notion that apoplexy is more often met with in countries with a temperate or warm climate than in equatorial regions, is perhaps corroborated by the fact that in every country the cases are *fewest in summer and most numerous in winter or spring*; or that cold, or an absolutely low temperature, has a decided influence on the frequency of the lesion. The proof of that is contained in the adjoining table, compiled from a large number of observations to show the incidence of the disease in the several months and seasons.

Some observers profess to have found that *fluctuations of the barometer*, corresponding to change in the atmospheric pressure, have an influence on the number of cases of apoplexy; but it is impossible to decide the point from the want of an exact knowledge of the circumstances. It is a significant thing that some observers consider a high barometer, or a rise of the mercury, to be the determining factor in the pathogenesis; while others take it to be the lowness of the barometer or the fall of the mercury.

Bürger¹ has recently made inquiries on the point in question in connexion with cases of apoplexy in the superior district of Gerabronn (Württemberg) from 1877 to 1879. He comes to the conclusion that of 78 cases, 53, or 59 per cent., happened when the glass was falling, and 19, or 25 per cent., when it was rising. It appears to me that the cases are too few for drawing conclusions of that general kind from; and that those used by Bürger are the less adapted to carry conviction, for the reason that 23 out of 60 cases specified by him were diagnosed, not "head-stroke," but "heart-stroke."

Again, Smith's statement for the Peruvian plateau and Jourdanet's for the Anahuac of Mexico, that apoplexy is particularly common at considerable *elevations* (2000 metres

of another kind. What we have to understand by the commonness of "apoplexy" in Ceylon and on the Sierra Leone coast will appear from the statements of Thomson and Clarke respectively, that it occurs mostly among opium-eating Malays and in negroes "from excessive drinking." Not less suggestive are many other reports from non-tropical countries, of a quasi-epidemic prevalence of apoplexy during a very hot summer; for instance, it was certainly heat stroke in Italy in 1694, and probably that condition also in Italy and Russia in 1807.

¹ 'Württemberg. med. Correspondenzbl.,' 1882, No. 11, p. 17.

	Copen- hagen.	Berlin. ¹	Ham- burg.	Frank- furt.	Hesse.	London.	Holland. ²	Milan. ³	Pied- mont. ⁴	Turin. ⁴	Verona. ⁵	Genoa. ⁴	Rome.	Malta.
F	127	143	322	133	—	—	1535	1075	438	40	31	27	113	137
July	137	163	321	170	—	—	1491	1076	490	68	36	24	173	207
August	113	129	286	134	—	—	1298	1030	406	44	37	28	158	183
September	377	435	929	437	296	1660	4324	3231	1334	161	104	79	444	537
October	106	151	318	145	—	—	1414	956	403	48	39	34	132	173
November	108	123	301	119	—	—	1341	848	348	44	23	21	145	131
December	110	138	321	130	—	—	1349	879	318	61	23	19	79	114
1880	324	412	940	394	271	1627	4104	2633	1069	153	85	74	356	418
July	102	120	270	121	—	—	1057	681	306	43	27	20	78	93
August	111	102	219	116	—	—	1057	629	312	33	33	13	108	86
September	87	119	246	131	—	—	1042	645	300	30	18	9	98	80
October	300	341	735	368	258	1420	3156	2015	918	106	78	52	284	259
November	93	103	240	114	—	—	936	718	321	33	22	16	85	97
December	117	157	284	116	—	—	1203	822	355	44	24	28	103	112
1881	120	135	319	109	—	—	1267	903	401	47	28	30	123	117
1882	330	395	843	339	249	1620	3433	2503	1077	124	72	74	311	326

¹ For the years 1880 and 1881.² Ferrario, 'Statistica delle morte improvise, &c.,' Milano, 1834, 57.³ Evers, 'Bijdrage tot de bevolkingsleer van Nederland,' S'Gravenhage, 1882, 107.⁴ Parola, 'Saggio di climatologia e di geogr. nosol. dell' Italia,' Torino, 1881, 727, 728. The figures for Turin, Verona, Genoa, and

Rome are not the absolute number of deaths from apoplexy, but ratios of the mortality from it in the several months.

or 6500 feet, and upwards), and that it is due to the altered tension of the vessels depending on the lesser weight of the atmosphere, lacks the support of statistics ; not to mention that the rarefaction of the air to that degree in which it obtains at the greatest elevations inhabited by man, cannot be shown to have the slightest effect on the mechanics of the circulation, or, in other words, to alter the pressure of the blood within the vessels.

§. 173. NO RACIAL PREFERENCES.

Circumstances of race would appear to have no significance for the frequency of apoplexy. At all events Pruner says, from his Egyptian experience, that the white and coloured races suffer from it equally ; and, according to the statistics of mortality in New Orleans, the ratio of deaths from apoplexy among the whites and the negroes was as 0·91 to 1·03, showing no great disparity.

CHAPTER XVIII.

EPIDEMIC CEREBRO-SPINAL MENINGITIS.

§ 174. FOUR EPIDEMIC CYCLES IN EUROPE AND AMERICA DURING THE LAST FIFTY YEARS.

Towards the end of the thirties in the present century there appeared in certain parts of France and Southern Italy a form of epidemic disease which the medical practitioners of those localities failed to recognise. Its phenomena were of the type of an inflammation of the cerebral and spinal membranes, but it had at the same time the character of a constitutional malady, and it was spoken of, according to the view taken by those who observed it, either as "meningitis cerebro-spinalis epidemica," or as "typhus cereбрalis." Shortly after, the same disease was seen in Algiers, in the United States, in Denmark and elsewhere ; in the twenty or thirty years following, it spread over a large part of Europe, showed itself at a number of points in Nearer Asia, in Africa, and in South America, and became prevalent time after time in wide-spread epidemics, more particularly in the United States. Within the last ten years it has been seen less often and within narrower limits ; but to the present day it keeps its place among the sicknesses of the people in most of the countries which it visited originally. The historical research which was set on foot whenever the disease became known, has resulted in showing that there had been previous epidemics of it in the early years of this century at various parts of Europe and the United States ; but so far as concerns former centuries, there is no trustworthy information of its existence ; and at all events the general diffusion that we have been speaking of is an affair of recent date.

The *history of epidemic meningitis*, so far as we know it, may be divided for epidemiographical purposes into four periods. The first, from 1805 to 1830, shows us the disease in isolated epidemics at various places in Europe, but more general in the United States. In the second period, from 1837 to 1850, meningitis becomes prevalent in wide-spread epidemics in France, Italy, Algiers, the United States and Denmark. During the third period, from 1854 to 1875, the malady reaches its widest diffusion throughout most of Europe, the adjoining countries of Nearer Asia, the United States, and some parts of Africa and South America. The fourth period, from 1876 to the present day, is a return to merely casual epidemic outbreaks, or to more or less considerable groups of cases here and there within its former distribution-area.

The *earliest information* on epidemic meningitis dates from 1805, in which year the disease was prevalent in Geneva and the vicinity of the city in the months of February, March and April, and among all ranks equally.¹ Next come the epidemic outbreak at Grenoble in February, March and April, 1814, among the soldiers of the garrison,² and the concurrent epidemic in the garrison of Paris.³ In 1815 there is an epidemic at Metz,⁴ and one in the spring of the same year at Albenga, Cereale and two or three more villages in the province of Genoa.⁵ In the spring of 1822, many cases of epidemic meningitis occurred at Vesoul,⁶ and in the winter of that year the disease was epidemic at Dorsten in Westphalia.⁷ In all probability the epidemic of "acute hydrocephalus" which Albert saw in the spring of 1827 at Wiesentheid in Lower Franconia is to be counted in this connexion; perhaps also the sickness at Sunderland in the autumn of 1830, the account of which by Scott was written out afterwards from somewhat faded recollections of it.

In the *United States*, the disease reached a very considerable diffusion in the first of our four periods, and was spoken of by those who saw it⁸ under the names of "sinking

¹ Vieusseux. An alphabetical list of references to all the authorities quoted in the text is given at the end of the chapter.

² Comte.

³ Biett.

⁴ Rampont.

⁵ Sassi.

⁶ Pratbernon.

⁷ Sibergundi.

⁸ S the papers by Strong, North, Fish, Hale, Miner and Williams.

typhus" or "spotted fever."¹ It appeared first in New Hampshire and Massachusetts, later in Connecticut, New Jersey, Vermont and Maine (1814), the epidemic being kept up continuously at one place or another in New England until 1816. Meanwhile it showed itself in Canada in 1807, in Virginia, Kentucky and Ohio in 1808, in New York State and Pennsylvania the year after, and, according to not altogether trustworthy information, it was prevalent at a later date in the Southern and Western States as well. The year 1816 forms the close of that time of sickness; with the exception of two quite localised epidemics, one at Middletown, Conn. in 1823, and the other at Trumbule,² Ohio, in 1828, the United States were absolutely free from epidemic meningitis from that date down to the year 1842, so far, at least, as we may infer from the silence of the epidemiographical authorities.

The *second period* begins with the breaking out of epidemics of meningitis simultaneously in two localities of the South of France—Bayonne and the department of the Landes on the one hand, and the districts of Foix and Narbonne on the other. From those centres the malady extended over a great part of France within the next ten years. Its first appearance at Bayonne, in 1837, was in epidemic form, and it was again epidemic there in 1840; but between these dates the cases were only occasional, and from first to last it was strictly limited to the garrison.³ Almost at the same time as in Bayonne, it appeared in the Landes, among a number of villages and small towns along the course of the Adour.⁴ In these it affected the ordinary residents; but it was solely the troops in the garrisons whom it attacked at Bordeaux⁵ and La Rochelle⁶ (where it had been seen already in 1837); and it was again confined to the garrison when it reappeared at Bordeaux in 1839.⁷ Early in 1838 it showed itself at Rochefort, at first in isolated cases in a regiment which had

¹ The term "spotted fever," which has led to much confusion with exanthematic typhus, is explained by the almost constant occurrence in certain of the United States epidemics of an exanthem of the petechial sort. In the subsequence that extent nowhere but in Ireland; and there

⁴ Lamothe, Lospés.

is, p. 12.

⁷ Gassaud.

arrived from the Landes; but at the end of that year it broke out in the bagnio, both among the convicts and among the civil and military staff of the prison, while occasional cases were seen at the same time among the inhabitants of the town.¹ At the beginning of 1839 the epidemic appeared at Versailles, in the first instance among those very soldiers who had come from the Landes to Rochefort and had been transferred thence in 1838 to Versailles; it quickly attained the dimensions of an epidemic, which was strictly within the limits of the garrison, as were also the occasional cases of the following year and the second epidemic in the year 1848.² Although the malady disappeared from Versailles in 1841, many cases of it came to notice in Paris³ in the summer of 1842.

In the meantime three new centres of the disease had sprung up in the north-west and north-east of France. One of these was almost entirely within the basin of the Loire. The malady occurred first at Laval in the spring of 1840; it continued to be epidemic in the garrison until the end of the following year, but among the townspeople it showed itself only here and there towards the end of its prevalence.⁴ After that, in the winter of 1840-41, there were a good many cases at Le Mans and Chateau-Gonthier⁵ among soldiers who had been transferred from Laval; and at the same time the disease became epidemic, or at all events very frequent, at various places in the country around: as at Poitiers, among the general population as well as the military;⁶ at Tours and Rambouillet, again both among civil and military;⁷ at Blois, in the garrison only;⁸ at Joigny⁹ and Ancennis¹⁰ in the winter and spring of 1841-42; and the same season at Nantes, where the epidemic extended to the soldiers and the townspeople equally.¹¹ The second new focus, smaller than that which we have been speaking of, but also in the north-west of France, included the following: the winter epidemics of 1840 and 1841 among the marines in the barracks at Brest,¹² that of the winter of 1840 among the troops at Caen,¹³

¹ Lefèvre, Lesson.² Faure-Villars.³ Blache.⁴ Martin.⁵ See Broussais, p. 12.⁶ Barilleau.⁷ Chevallier.⁸ Broussais, l. c.⁹ Matthieu.¹⁰ Garnier.¹¹ Mahot.¹² Guépratte.¹³ Felix.

and that of the spring of 1841 in the garrison of Cherbourg.¹ The third new centre was in the north-east of France. It began with an epidemic of meningitis in the winter of 1839-40 in the garrison of Metz;² in the autumn of 1840 the sickness appeared at Strassburg, where it lasted both among the military and in the town until the summer of the year following,³ having meanwhile spread, along with detachments of troops, to a number of places near, such as Schlettstadt,⁴ Hagenau, Buxweiler and Wasselonne, at all of which, except Schlettstadt, it was confined to the military. Its next appearance was in 1841 at Nancy, where all the cases but one were among the soldiers;⁵ and lastly it showed itself at Colmar,⁶ but only in occasional cases in the garrison.

We have already seen that the districts of Foix and Narbonne became a second point of departure of epidemic meningitis in the South of France simultaneously with its appearance at Bayonne in 1837. In the beginning of the year following it showed itself in its most destructive form on the flat ground of Hers⁷ near Toulouse; in the spring of the same year it was in the garrisons of Nîmes⁸ and Toulon;⁹ and in the winter and spring of 1839-40 among the troops in Avignon, where it reappeared the winter after (1840-41) on that occasion spreading to a considerable extent among the townspeople.¹⁰ During the same season it was epidemic in the garrisons of Perpignan¹¹ and Montbrison; in the winter of 1841-42 at Marseilles among soldiers returned from Algiers,¹² and, of an extremely malignant type, among the inhabitants of Aigues-Mortes;¹³ and lastly at the end of 1842 in Lyons, where there were only a few cases seen in the garrison.¹⁴

With the year 1842 that succession of epidemics comes to an end. In the years immediately following, it would appear that cases of the disease were seen only now and then in various garrison-towns of France. It is not until 1846-50 that we again meet with references to extensive epidemics

¹ Id. ² Gasté. ³ Tourdes, Wunschendorf, Forget, Frankl.

⁴ Mistler. ⁵ Rollet, Simonin. ⁶ Martin.

⁷ Bernard. As long after as the summer of 1842, according to Popis, cases of meningitis epidemica occurred here and there among the townspeople of Toulouse.

⁸ Durand. ⁹ Léonard. ¹⁰ Gérard, Chauffard, Barnouin.

¹¹ Paul. ¹² Boudin, 'Géogr.' 572. ¹³ Schilizzi. ¹⁴ Peysson.

of meningitis among the military, including the following: in the garrisons of Avignon¹ and Lyons² from autumn, 1846, to spring, 1847; among soldiers at Nîmes,³ Toulouse,⁴ St. Etienne⁵ and Metz⁶ in the winter of 1847-48; same season in Paris, where the disease went on until the spring of 1849;⁷ also in Orleans, where there were some cases among the townspeople towards the end of the epidemic,⁸ and in Bourges;⁹ at Lille¹⁰ in the spring of 1848, and at Toulon¹¹ in 1850. Among the civil population during this period, the malady became epidemic only twice—in the winter of 1848-49 at Corbeil,¹² and the same winter at Petit-Bourg (Bourbon-Vendée), where it was seen among the pupils of the "colony" and in some other young persons.¹³

The occurrence of epidemic meningitis in Algiers had probably some connexion with its general prevalence in France. It appeared in that colony first at the beginning of 1840 in the villages of Setif and Bathna situated on the plateau of the province of Constantine; at the same time it occurred at the military post of Douera, not far from Algiers, being also in an elevated situation, where most of the cases were among the French troops.¹⁴ Early in 1841 the disease appeared in the town of Algiers itself, and in the village of Blidah on the slope of the Lesser Atlas to the south-west of Algiers; it was general both among the military and the civil population,¹⁵ and in the winter following (1841-42) it attained a very wide diffusion through the central and eastern parts of the country (provinces of Alger and Constantine).¹⁶ In 1844 meningitis was epidemic in the town of Constantine; and in the winter of 1845-46 in Philippeville, Douera and other towns and villages of each of the above-named provinces, on this occasion principally among the French troops.¹⁷ But the worst epidemic in Algiers was in the winter of 1846-47, when the disease was prevalent not merely in a number of towns of Alger and Constantine, but also, and for

¹ Bechet.² Mouchet.³ Falot.⁴ Roque d'Orbecastle.⁵ Poggioli.⁶ Boudin, 'Geogr.,' 575.⁷ Levy.⁸ Corbin.⁹ Boudin, l. c.¹⁰ Maillot.¹¹ Giraud.¹² Piorry.¹³ Ferrus.¹⁴ Bertherand, Guyon (i, ii).¹⁵ Guyon (i).¹⁶ Bertherand, Guyon (iii).¹⁷ Bertherand, Boudin, 'Géogr.,' 575, Magail.

the first time, among the Arab population in remote parts of the country.¹

Next to France, the widest diffusion of epidemic meningitis on European soil during this second period was in *Southern Italy*. Our earliest information of it there comes from the villages of Mignano and Cervaro² (Terra di Lavoro) in the winter of 1839-40. It reappeared in them, and broke out in St. Elia, Durazzano³ and other communes⁴ in the winter of 1840-41, and for the same season there are notices of it in Canova, Spinazzola,⁵ Aquaviva⁶ and other villages of the province Terra di Bari; also of a considerable amount of it at a number of places in the province of Principato ulteriore (Rocca, Evandro, Eboli,⁷ Santo Marzano,⁸ Frigento⁹ and Cotrone¹⁰); further in some communes of Basilicata (Melfi,¹¹ Torricollo,¹² Pescopagano¹³), in the village of Martina¹⁴ belonging to the Terra d'Otranto, in the vicinity of Naples (among the galley-slaves in Procida¹⁵), and to a considerable extent in some communes of Calabria ulteriore secunda¹⁶ (Belcastro,¹⁷ Mesarica,¹⁸ Ponte Corvo, Santo Valentino, Santa Agata de Gotis and Maida). In the winter of 1843-44 it reappeared in the village of Crucoli,¹⁹ district of Cotrone (Calabria ult. sec.); that winter also marks its first appearance in Sicily, where it was epidemic during most of the year 1844 at a number of places (Agliastro, Carini, Caltanissetta, Misterbianco (near Catania), and the district of Terra nuova²⁰). This Italian epidemic closes with the outbreak in the spring of 1845 in the Terra di Lavoro, at the two villages of Alife and Piedemonte.²¹

The only other country of Europe in which epidemic

¹ Bertherand, Besseron, Lagrave, Barberet, Chagron.

² Spada, Semmola.

³ Razzono.

⁴ Santorelli, de Renzi (i, ii).

⁵ Brandonisio (i), Agostinacchio.

⁶ Brandonisio (ii).

⁷ Elefanti.

⁸ de Renzi (iii).

⁹ Flamina.

¹⁰ Angeluzzi.

¹¹ del Zio.

¹² Pagano.

¹³ Araneo.

¹⁴ Marinosci.

¹⁵ de Renzi (iv).

¹⁶ Telapi.

¹⁷ Spadafora.

¹⁸ Falese.

¹⁹ Mercurio.

²⁰ Ref. in 'Gaz. méd. belge,' 1844, No. 38, p. 160; Ughetti. See also the excellent work by Guiffé ('Sulla meningite cerebro-spinale epidemica in Sicilia,' Palermo, 1885), which reached me too late, unfortunately, to be made use of in the text.

²¹ Coppola.

meningitis was prevalent to any considerable extent during this period (1845-48) was *Denmark*. It broke out first in the spring of 1845 in the sanitary district of Frysenborg (province of Aarhus, Jütland), where it showed an epidemic character and received the name of "hjernfeber" (brain fever). Many cases of it were seen at the same time in other parts of Jütland, as well as in Fünen, Lolland and Seeland (especially Copenhagen).¹ It reappeared in the winter of 1846, this time mostly in Iceland;² and there are similar accounts of it from various parts of the kingdom in the winters of 1847³ and 1848.⁴

In other parts of Europe meningitis occurred during this period in merely isolated epidemics or in small groups of cases. From *Spain* there is mention of a slight epidemic at Gibraltar in 1844; it was almost entirely among the townspeople, only a few cases having been seen among the troops.⁵ In *Corfu* it appeared for the first time in 1843, and was of a very malignant type.⁶ In the winter and spring of 1845-46, it was seen in several *Irish* workhouses, including those of Dublin, Bray and Belfast;⁷ and occasional cases of it occurred at the same time in Liverpool.⁸ In the summer of 1850 it reappeared in Dublin, and continued into the winter, although of a very mild type;⁹ and there were a few cases of it at Rochester the same year.¹⁰ For *Germany* also, there are references to a few slight epidemics of "encephalitis" and "acute hydrocephalus," which in all probability relate to the form of meningitis here in question: one of these was at Meiningen¹¹ in 1834, others in the spring of 1835 at Barmen, Bergheim and Münstermayfeld in the Rhine country,¹² and another in the summer of 1843 at Steinheim¹³ in the circle of Höxter, Westphalia.

¹ Ditzel, Uldall, 'Sanhedskollegiums Forhandlingar for Aaret 1846,' 53.

² *Ib.* for 1847, 28.

³ *Ib.* for 1848, 39.

⁴ *Ib.* for 1849, 34.

⁵ Gillkrest, Thompson, 'Report on the Sickness and Mortality among the British Troops,' Lond., 1853, 86.

⁶ Belleli, Stephanos.

⁷ Mayne.

⁸ Whittle.

⁹ McDowell.

¹⁰ Brown.

¹¹ Jahn, 'Versuche für die pract. Hlkd.,' Eisenach, 1835, 1.

¹² 'Generalbericht des Rhein. Med.-Colleg. für das Jahr 1835,' 39.

¹³ 'Sanitätsber. des Med.-Colleg. von Westfalen für das Jahr 1843,' 47.

A number of typical cases of meningitis epidemica were seen at Würzburg¹ in June, 1851; perhaps that was also the nature of the epidemic which was prevalent in the summer of 1853 at some other places in Lower Franconia (Uffenheim, Ochsenfurt and Aub), although I am unable to speak positively about it.²

During this second period, epidemic meningitis again came to considerable diffusion in the *United States*, having been epidemic from 1842 until the winter of 1849-50. The malady was seen first at the beginning of 1842 in the County of Rutherford³ in the heart of Tennessee, and at Montgomery,⁴ Alabama. We hear nothing of it in 1843 and 1844; but in the autumn of 1845 it appeared at Mount Vernon, the chief town in Jefferson County, Ill., and at other places in the south of that State;⁵ in the winter of 1846-47 in the counties of Bentonville⁶ and Union,⁷ Arkansas; at the beginning of 1847 in Vicksburg,⁸ Miss.; and the same year in Hardman County,⁹ Western Tennessee, at Rocheport¹⁰ in Boone County, Mo., and at New Orleans among a regiment of recruits who had come from Mississippi State.¹¹ In the spring of 1848 it reappeared in Montgomery, and extended to the plantations in the neighbourhood;¹² the same season it was very destructive in the extreme west of Pennsylvania, in Beaver County on the Ohio.¹³ In March, 1848, it was seen in the towns of Millbury and Sutton, in Worcester County, Mass.;¹⁴ and there were a good many cases among negroes at New Orleans¹⁵ in January and February of 1850.

Third period.—This begins with the outbreak of the disease in 1854 in *Sweden*, a country hitherto quite free from

¹ Rinecker.

² Dr. Werr, of Uffenheim, medical officer of the district, has been so good as to send me an extract relating to this epidemic from his medical report, drawn up at the time. The disease had the pronounced symptoms of an acute affection of the cerebral and spinal membranes, and it attacked adults only. In one case examined after death, they found a "sero-sanguineous" exudation on the cerebellum and medulla, and in the space around the cord.

³ Richardson.

⁴ Boling.

⁵ Gray.

⁶ Bell.

⁷ Chester.

⁸ Hicks.

⁹ White.

¹⁰ Philipps.

¹¹ Lowe.

¹² Ames.

¹³ Account in 'Trans. Pennsylv. State Med. Soc.,' 1857.

¹⁴ Sargent.

¹⁵ Fenner.

it but now destined to a most serious visitation lasting more than ten years.¹ Early in 1854 epidemic meningitis was seen at Gottenburg, and towards the end of the year in Blekingelän and Kalmarlän, but only in somewhat scattered cases. It was not until the first six months of the year following (1855) that it attained to epidemic prevalence in these centres; and during the same season smaller foci of it were established here and there in the provinces of Christianstad, Jönköping, Bohus and Södermanland. In its progress northwards from the southern extremity of the country it got no farther than the town of Kalmar by the end of the season. During the last six months of 1855 the epidemic was extinct; but it broke out anew in January, 1856, and now spread northwards from its former seats through the northern part of Kalmarlän and the provinces of Jönköping and Oestergötland; meanwhile slight epidemics appeared here and there in Blekinge, Bohus, Gottenburg, Elfsborg, Oerebro and Wermland. That year its northern limit was Philipstad in Wermlandlän. In May the epidemic had died out everywhere, to reappear at the commencement of the following year. Its distribution-area was now a broad zone including the eastern shore of Lake Wener and the northern parts of Skaraborglän, the country north of Lake Wetter as far as the southern part of Oerebrolän, both shores of Lake Mälär with the northern division of Södermanland, the southern part of Westmanland and the districts of Upsala and Stockholm. There were also isolated epidemics the same year at a number of villages in Kalmar, Jönköping, Linköping, Gottenburg, Bohus and Stora-Kopparborglän. That season the epidemic died out in June, having got as far as the latitude of 61° N. It was in the year 1858 that epidemic meningitis reached its greatest height in Sweden. It was most severe in the provinces of Upsala, Westmanland, Oerebro, Wermland, Stora-Kopparborg and Gefleborg; but slighter epidemics were seen also in the provinces of Malmohus, Christianstad, Gottenburg, Jönköping, Oestergött-

¹ See the accounts by Altin, 'Hygiea,' 1859, xix, 718; Acharius, ib., 1859, xxi, 4; Wistrand, Lindström, reports in 'Sundhets-Colleg. Berättelse om Medicinal-verket i Sverige,' 1856, 43; 1857, 43; 1858, 40; 1859, 46; 1860, 45; 1861, 83; 1862, 29; 1865, 29; 1866, 41; 1867, 19.

land, Skaraborg, Elfsborg, Södermanland, Westernorrland and Jämtland; and the disease was observed that year to a considerable extent in the southern province of Kronoborg, which had escaped hitherto, as it did in future. It reached that year to the latitude of 63° N., which has been its northernmost limit in Sweden.

In the following season (1859) a considerable decline of the epidemic was remarked, both in the extent of its several foci and in the number of cases in each. The only considerable epidemics were in Stora-Kopparborg and Gefleborg; in the districts of Upsala and Skaraborg there were smaller epidemics; as well as a certain number of cases in the southern provinces. In 1860 the disease was confined within still narrower limits, being of more considerable extent only in Oerebrolän at the northern extremity of Lake Wetter. From 1861 to 1864 there were merely occasional cases at a large number of places. In 1865-67 slight epidemics sprang up once more in the provinces of Upsala, Halland, Malmöhus, Stora-Kopparborg, Elfsborg, Kalmar, Jönköping, Oerebro, Södermanland, Oestergötland and Götland. Since that time no epidemics of meningitis have been seen in Sweden. The number of deaths from the disease officially returned in 1854-60, and 1865-67 was 4577.

Norway has remained almost exempt. Only twice has the epidemic been in that country: viz. a very malignant form of it during the first three months of 1859 in the village of Opdal (Hedemarken)¹; and the year after to a slight extent, in the village of Rangsaker in the same province.² In Denmark, too, there was only one epidemic during this period, in a few villages of northern Jütland during the winter and spring of 1873-4.³

Another of the principal seats of meningitis epidemica during its third period was Germany, where it reached its height in 1864 and 1865. The disease had been already seen in 1863 in a few localities of Silesia (Liegnitz and particularly the valley of the Neisse); but in the winter and spring of 1863-64 it broke out almost simultaneously at a

¹ Arntz.

² Beretning om Sundhetstilstanden i Norge i Aaret 1860, 40.

³ Heiberg.

number of points in East and West Prussia, Posen, Brandenburg and Pommerania, and was epidemic therein until the end of the following winter. Our detailed information about this widely-spread sickness comes from Ottomachau¹ and the vicinity, Bromberg,² the department of Stettin,³ East Prussia,⁴ West Prussia,⁵ Berlin,⁶ Zellin (Neumark)⁷ and the department of Potsdam.⁸ In the North-West it was seen in the spring of 1864 at Emden⁹ and in the vicinity; but it was not until the winter and spring following (1864-65) that it became epidemic in Hanover¹⁰ (at Dransbeck, Celle, Sinbeck and Hildesheim), and in Brunswick.¹¹ The same season witnessed its first epidemic outbreak at Leipzig¹² and at a number of places in Thuringia.¹³

In South Germany its chief seats were the Bavarian departments of Central, Lower, and Upper Franconia. At Erlangen¹⁴ and Nürnberg,¹⁵ a good many cases of meningitis epidemica had been seen in the summer and autumn of 1864; but it was not truly epidemic until the following winter and spring. Among the districts that had the epidemic during that season were Erlangen, Hersbruck, Nürnberg, Fürth, Neustadt, Scheinfeld, Uffenheim, Ausbach, Heilbronn and Schwabach in Central Franconia;¹⁶ the districts of Ebermannstadt, Neila, Forchheim, Kronach, Pottenstein, Bayreuth, Bamberg, Hof and Lichtenfels in Upper Franconia;¹⁷ the districts of Schweinfurt, Karlstadt, Ochsenfurt, Aschaffenburg, Arnstein, Rothenbuch, Hammelburg, Lohr and other parts of the Spessart in Lower Franconia.¹⁸ In the Upper

¹ Hanuschke.

² Salomon (i).

³ According to the official report kindly sent to me by Herr Medicinal-Rath Göden.

⁴ Siegfried, Pabst.

⁵ Hirsch, Zülchauer (for Graudenz).

⁶ Fräntzel.

⁷ Remy.

⁸ According to the official reports of the governmental department of Potsdam, which I have had the opportunity of inspecting.

⁹ Private information from Herr Medicinal-Rath Stöhr.

¹⁰ Ref. in 'Hannov. Ztschr. für Heilkde.' 1866, 293; Schuchardt (i).

¹¹ Salomon (ii).

¹² Wunderlich.

¹³ Pfeiffer, Gerhardt, Schuchardt (ii), Groos, Otto (Schwarzburg-Rudolstadt).

¹⁴ Wollner, Ziemssen.

¹⁵ Merkel and Reuter.

¹⁶ Ref. in 'Bayer. ärztl. Intellgzbld.' 1865, Nr. 30, 409; Frohmüller (Fürth).

¹⁷ Dotzauer, Flügel (Neila), Seggel (Forchheim).

¹⁸ Ref. in 'Bayer. ärztl. Intellgzbld.' 1865, 377, 403; Lindwurm (for the Spessart).

Palatinate the more special centres were Auerbach and Eschenbach;¹ cases were also seen in some parts of the circle of Swabia² (Augsburg, Türkheim, Oettingen), as well as at Regensburg,³ Landshut,⁴ and Munich,⁵ but not to the extent of a real epidemic. Coinciding with its general diffusion in Bavaria, we have its appearance in Hesse and Baden: in Hesse its chief centres were Gadensberg, Neukirchen, Nentershausen and Sontra;⁶ in Baden they were Rastatt,⁷ Karlsruhe, Freiburg, Baden-Baden;⁸ and there were also cases more or less numerous, in the districts of Gengenbach, Offenburg, Säckingen, Constance, Donaueschingen and Durlach.⁹ In the spring of 1866 there was an epidemic all by itself in the village of Hochdorf near Freiburg-in-Breisgau.¹⁰

Meanwhile there had been slight epidemics in Frankfurt¹¹ and Cologne;¹² also in Würtemberg in the spring of 1865 the cases were merely sporadic in a number of villages.¹³ By the end of 1866 the disease in Germany had lost its epidemic character; and in after years it was seen only in sporadic cases, unless in a few limited epidemics: such as those of Danzig¹⁴ and Königsberg¹⁵ in the winter of 1869-70, and those of Berlin,¹⁶ Bonn,¹⁷ Mannheim¹⁸ and Munich,¹⁹ in the winter and spring following.

In *Austria* and *Hungary* epidemic meningitis has had a very limited diffusion, so far as we can gather from the scanty records of it furnished by these countries. In the spring of 1863 it was prevalent in the orphanage of Vienna;²⁰ in the winter of 1865-66 in the Hungarian county of Gömör;²¹ and in the winters of 1866-67 and 1867-68 at Pola and other places in Istria,²² and at Trieste and some adjoining villages (St. Vito, Servola, St. Giacomo).²³ In *Russia* it was

¹ Ref. in 'Bayer. ärztl. Intelligzbl.,' 1865, 228.

² Ref., ib., 426.

³ Ref., ib., Nr. 17.

⁴ Ib., Nr. 18.

⁵ Ib., Nr. 21, 23, 28, 29.

⁶ Private information from Herr Medicinal-Rath Hildebrand; Bauer.

⁷ Niemeyer, Gawalowsky.

⁸ Zimmermann.

⁹ Ref. in 'Bayer. ärztl. Intellig l.,' 1865, Nr. 23.

¹⁰ Werber.

¹¹ V rapp.

¹² Eulenberg.

¹³ Fabst.

¹⁴ Zeroni.

¹⁵ Ullmann (i, ii).

¹⁶ de Moulon.

first seen in the spring of 1863 in the government of Kaluga; and next year in the Caucasus;¹ it was also in the summer of 1864 that the first cases appeared at St. Petersburg, where it lasted until the summer of 1868 without becoming epidemic to any considerable extent.² To the same period belongs its earliest epidemic outbreak in Russian Poland;³ the first cases were seen at Kolo in 1865, it came to Warsaw in January and February, 1866, and about the same time it was in the neighbourhood of Konin, Paryszew and Minsk (Lithuania). From 1867 to 1869 it became more general in these provinces, and broke out also at a number of points in Galizia. Early in 1866 there had been many cases of it in Moscow;⁴ and in the winter of 1867-68 an epidemic of meningitis developed in Simferopol which spread over the whole of the Crimea and was especially severe in the towns of Bakchi-Serai, Alushta, Sebastopol and Eupatoria.⁵ From Roumania we have an account of a slight epidemic at Jassy⁶ in the winter of 1869; the same year it was in Turkey and at Magnesia near Smyrna; and the year after in Smyrna itself.⁷ In Greece it was first seen in 1863-64 in the epharchy of Phthiotis, during the winter of 1868-69 in Nauplia and Milos, shortly after in Argos, Tripolis, Athens and other places, spreading so widely in that and the two following winters that no province of the country except the Ionian Islands escaped.⁸

The south and west of Europe were but slightly affected during this period. In the winter of 1866-67, epidemic meningitis occurred a second time in Dublin and other parts of Ireland, particularly among soldiers;⁹ and on English soil in a village near Lincoln the same season.¹⁰ In the Netherlands it was seen in the winter of 1860-61 among the garrison of Arnhem;¹¹ and in the spring of 1867 a slight epidemic sprang up in the village of Giethorn (Overijssel).¹² In

¹ Rudnew and Burzew.

² Korczewski.

³ Küttner, Herrmann, Kernig.

⁴ Rudnew.

⁵ Hörschelmann.

⁶ Singer.

⁷ Diamantopulos.

⁸ Kotsionopulos, Valassopulos, Rizopulos, Tipaldos, Stephanos.

⁹ Accounts in 'Med. Times and Gaz.,' 1867, May, 561, June, 595; Mapother, Marston, Gordon, Collins, Haverty.

¹⁰ Lowe, Woolley.

¹¹ Account in 'Nederl. Tijdschr. voor Geneesk.,' 1867, v, 15; 1868, vi, 36.

¹² Account in 'Verslag van het geneesk. Staatstoezicht in het jaar 1867,' 199.

Switzerland occasional cases were seen at Basel in 1859, and again in 1870; but in 1871 it became more extensively epidemic there¹ and in a number of Bernese villages.² In *France* there were some cases among the Bordeaux³ garrison during the winter of 1867-68, and a small epidemic among the troops in Strassburg⁴ in the spring of 1868. In *Italy* it was seen at Bologna⁵ for the first time in 1873, and at Rome⁶ in the winter of 1873-74. In the spring of 1874 it spread for the second time widely over Southern Italy, especially in the vicinity of Naples and around Spinazzola, Minervino, Castelana and other places in the province of Terra di Bari, in the district of Salerno, and in the provinces of Foggia, Capitanata, Apulia and Campania, where it continued to be prevalent until the winter of 1875-76;⁷ and it was epidemic also around Cremona⁸ in the summer of 1875. From *Portugal* we hear of it in the winter of 1861-62 on the hilly ground along the right bank of the Tagus near the Spanish frontier, especially among the villages of Montforte, whence it extended in the directions of Oporto and Lisbon.⁹

In *Asia* we meet with the disease, besides the outbreak of it already mentioned near Smyrna, at Jerusalem in the spring of 1872, the cases being merely occasional,¹⁰ and in *Persia*¹¹ in 1874 and 1875. In *Africa* there was a slight epidemic in January, 1868, at Setif in Algiers among a company of Algerian *tirailleurs*.¹²

The *United States* were again the chief seat of epidemic meningitis in this its third period. From 1857 to 1854 scarcely a year passed without its being seen over a larger or smaller area, its diffusion from first to last covering the whole of the country.

This series of epidemics begins with the outbreak of the malady in 1856-57 in two regions far apart, one of them being North Carolina,¹³ whence we have details of it in Salisbury¹⁴ (Rowan county), and the other New York State,¹⁵ where its visitation was mostly in the western and central

¹ Hagenbach.² Amez-Droz.³ Larivière.⁴ Bertrand.⁵ Verardini.⁶ Marchiafava e Celli.⁷ Giampietro, Amoroso, Borelli.⁸ de Giovanni.⁹ Gaskoin, Marquess.¹⁰ Sandreczky.¹¹ Tholozan.¹² Alix.¹³ Dickson.¹⁴ Summerell.¹⁵ Thomas.

counties of Onondaga,¹ Chemung,² and Madison.³ During the Secession war of 1861-63 the sickness became more widely spread. In the winter of 1861-62 it appeared in the army of the Potomac encamped near Washington;⁴ at the same time in Livingston county, Mo., both among soldiers and civilians;⁵ in that and the following winter among negroes⁶ sent by the Confederates to Memphis; and in the winter of 1862-63 among the troops encamped in and around Newbern, Craven county, N. Carolina.⁷ In the winter of 1863 a severe epidemic arose at Philadelphia⁸ and other places in Pennsylvania; in that and the following year it spread over a large part of the State,⁹ and was still going on in Philadelphia as late as the winter of 1865-66.¹⁰ In the winter of 1862-63, simultaneously with the outbreak in Pennsylvania, it appeared in La Grange county and other places in the north and south of Indiana,¹¹ in Norfolk, Va., among the Confederate troops,¹² in Iowa,¹³ at Newport, Rh. I. in the military school, making its first visit,¹⁴ and at Mobile.¹⁵ In the winter of 1863-64 it was epidemic in the southern and central parts of Illinois,¹⁶ in a few localities of New Jersey,¹⁷ in Vermont along the Connecticut river,¹⁸ in Springfield county and some parishes of Licking county, Ohio,¹⁹ at Washington in two hospitals and an orphanage (having been imported, it was said, from the seat of war)²⁰ at Mobile²¹ and in Green county, Alabama,²² and in the spring of 1864 in Frederick county, Maryland.²³ In 1865 the sickness would appear to have been in abeyance, if we may judge from the absence of all reference to it. But in the winter of that year it broke out anew in various parts of Illinois;²⁴ in the

¹ Kendall.² Squire.³ Saunders.⁴ Frothingham, Watson, Woodward.⁵ Prewitt.⁶ Morrill.⁷ Upham (i).⁸ Atlee, Jewell, Stillé, Levick, Gilbert, Gerhard, Wilson, accounts in 'Amet. Journ. of Med. Sc.,' 1864, July, 128 ff.⁹ See the accounts by Reid for the county of Montgomery, by Draper and Burr for the coal districts of Carbondale, by Harvey for Delaware Ct., and by Burns for Frankford.¹⁰ Wilson.¹¹ Jenks, Kempf.¹² Gerhard.¹³ Farnsworth.¹⁴ Keene.¹⁵ Armstrong.¹⁶ Davis, McVey.¹⁷ Burns.¹⁸ Ketchum.¹⁹ Dunlop, Black.²⁰ Horner (i).²¹ Armstrong (i).²² Robinson.²³ Baltzell.²⁴ Account in 'Transact. of the Illinois Med. Soc.,' 1867.

spring of 1866 in Breckenridge county, Kentucky,¹ and once more in Mobile;² and in the winter of 1866-67 at Philadelphia.³ For the winter and spring of 1867-68 we have accounts of the prevalence of epidemic meningitis in Huntingdon county,⁴ Pa.; in New York, where it was confined to one block of houses;⁵ and in Findley, Ohio.⁶ In 1869 we hear of it at various places in Indiana.⁷ In the winter of 1869-70 it reappeared in Green county,⁸ Alabama, and at Albion,⁹ in Erie county, Pa.; in the summer of that year it was in several parts of Virginia;¹⁰ and towards the end of the year in the south of Mississippi State.¹¹ In 1871 it became widely diffused in Minnesota¹² and in Pennsylvania;¹³ and in the latter it continued prevalent for two years longer in a number of places, such as Philadelphia¹⁴ and the counties of Lancaster,¹⁵ Huntingdon,¹⁶ Lehigh¹⁷ and Schuylkill.¹⁸ Coincident with this general prevalence in Pennsylvania was the outbreak of epidemic meningitis in 1872 in New Jersey,¹⁹ in New York City²⁰ and Brooklyn,²¹ and in some other parts of the State such as Westchester²² and Onondaga²³ counties; also in Montreal,²⁴ Canada; in Edwardsville,²⁵ Crawford²⁶ and other places in Illinois; and in a number of localities of South Carolina.²⁷ In 1873 Massachusetts had a severe visitation,²⁸ after an immunity of many years. The same year the malady was prevalent in the vicinity of Lake,²⁹ Indiana; and towards the end of the year an epidemic sprang up in Michigan which overran several counties and was particularly severe in Monroe county.³⁰ Subsequent to 1874 the United

¹ Moorman.² Baldwin.³ Githens.⁴ Brumbaugh.⁵ Brown (ii).⁶ Hurd.⁷ Ref. to Canada.⁸ Robinson.⁹ Logan.¹⁰ Horner (ii).¹¹ Pitts.¹² Notices in 'Transact. of the Minnesota State Med. Soc.,' 1872.¹³ 'Transact. of the Penns. State Med. Soc.,' 1872.¹⁴ Ref. ib., 1873, 205; 1874, 338.¹⁵ Ib., 159 and 1874, 271.¹⁶ Ib., 1874, 270.¹⁷ Ib., 1874, 276.¹⁸ Ib., 1874, 374.¹⁹ Account in 'Transact. of the N. J. State Med. Soc.,' 1873.²⁰ Morris, Smith, Whitehall, Packard, Sewall, Clymer.²¹ Rodenstein.²² 'Surg. Rep.,' 1872, April, 27.

(ii).

²³ Weller.

'Carol. State Med. Assoc.,' 1873.

²⁴ Baker.

States authorities are silent about epidemic meningitis; so that the disease as a wide-spread malady would appear to have ended for the present on American soil with the extinction of the epidemic last mentioned. Therewith also ends the third period in the history of the sickness.

Fourth period.—The last period in the annals of meningitis epidemica, embracing the years 1876-84, shows the malady retreating within narrower limits, so much so that it nowhere retains the character of a prevalent disease of the people. In 1876 there was a small epidemic at Birmingham;¹ another in the winter of 1884 at Galston near Glasgow;² and many cases in Dublin 1885-86 ('Brit. Med. Journ.,' June 26th, 1886, p. 1216). From Germany we hear of an epidemic in 1879 at Reichenbach in Silesia.³ The disease appeared also in some parts of Poland: as at Proszowice⁴ in the winter and spring of 1876-77, at Plozk⁵ in the spring of 1879, and in the following winter in Szydlowiec and vicinity⁶ and at Plonsk.⁷ In the spring of 1879 it was prevalent at several parts of Galizia, such as Chrzanow, Podgorze and Cracow;⁸ and at Békés⁹ and Papa¹⁰ in Hungary. The latest news of it in France shows it to have been epidemic in the spring of 1880 at Castres¹¹ and in the winter and spring of 1881-82 at Cherbourg,¹² both times in the garrison exclusively. It reappeared in Sicily from January to April, 1883, at Misterbianco near Catania;¹³ and in Greece from 1879 to 1881 there were several slight epidemics, as well as cases in more sporadic diffusion, at a number of places both on the mainland and in the islands.¹⁴

§ 175. GENERAL SURVEY OF ITS DISTRIBUTION.

This general outline of the history of epidemic meningitis shows that its *geographical area* includes the greater part of Europe. The countries in which it has been seen most extensively and oftenest are the following: France, mostly in the southern, western and northern divisions and least in

¹ Foster, Johnston, Russell.

² Frew.

³ Sabarth.

⁴ Rządowski.

⁵ Perkahl.

⁶ Maresz.

⁷ Jedrzejewicz.

⁸ Warschauer, Bondi.

⁹ Frey.

¹⁰ Löwy.

¹¹ Massonau.

¹² Kieffer.

¹³ Ughetti.

¹⁴ Stephanos.

the central ; Germany, much more in the north and the south-east than in the west ; Italy, particularly the southern provinces with Sicily ; and Sweden, as far up as 63° N., the provinces north of that line having escaped it. It has been a good deal less prevalent, and in fact comparatively rare, in Ireland, Russia (with Poland), Denmark (very restricted since 1848), Austria, Hungary and Greece ; and it has been absolutely rare in the Iberian Peninsula, Roumania and Turkey. It has not been seen in England, the Netherlands and Switzerland except in very occasional and slight epidemics ; while there has been complete immunity from it hitherto in nearly the whole of Scotland, in Belgium, in Northern and Central Italy, and in Iceland and the Faröe Islands. The only references to it in the east come from Asia Minor, Syria and Persia.¹ Algiers is the only African country where we hear of it ; and in that colony, so far as it appears, the whole of the western province of Oran has been quite free of it. Hitherto the head quarters of the disease, both as regards wideness of diffusion and severity of outbreak, have been the *United States*, where its area extends from Canada to the Gulf of Mexico,² and from the Atlantic to the Prairie States of Minnesota and Iowa. I do not know of any trustworthy accounts of epidemic meningitis from Mexico, Central America and the West Indies. From South America also there is merely an unconfirmed rumour that the disease had been prevalent in 1840 in Brazil and Monte Video.

§ 176. PECULIARITIES AS AN EPIDEMIC.

In the manner of its *outbreak*, *incidence* and *diffusion* as an epidemic, meningitis reveals many peculiarities which are not without significance for estimating the effect that exterior circumstances seem to have in the pathogenesis. In many instances, as the foregoing historical sketch makes quite clear, the outbreak of the disease was a perfectly isolated incident in a locality that had been altogether free from it before ;

¹India (see 'Indian Med. Gaz.,' May, 1886.)

²outs of meningitis epidemica in Georgia,
to me to be doubtful whether we should

it has appeared at one or more places, not unfrequently far apart, while the country round the affected villages or towns, as well as the whole territory lying between them, has remained quite untouched not merely while the sickness lasted, but in many cases also after it had died out in its original seats.¹ Even in its general diffusion in Italy, in the United States at a later period, and in Sweden and Germany, in which countries the disease did in fact overrun wide tracts of territory, the places affected by it were often only a few and far apart, while the intervening country, or the immediate neighbourhood, was touched in an extremely slight degree or spared altogether.²

A second peculiarity of its epidemic incidence comes out in the fact that in the epidemics, such as those just mentioned, which overran considerable tracts of country, the extension of the disease was much more rarely continuous or along certain radial lines than *per saltum* or quite irregularly, neither following the highways of traffic nor revealing any other obvious predilection. We find, no doubt, some exceptions to this, and very remarkable exceptions, in the diffusion of the epidemic through Central Franconia, where it travelled somewhat regularly from north-east to south-west; also in its progress during several of the French epidemics, in which it could be shown to have followed the movements of troops; and again in Sweden, where one can trace a certain regularity and uniformity in the progress of the epidemic from south to north. But if we go into the details of its course in these and other instances, we shall find reason to believe that in them also its progress was for the most part *per saltum*.³

Thirdly, the comportment of the epidemic in many cases was not less remarkable by reason of the differences that it exhibited at the various places affected, and in its several seasons. Often it broke out, over a larger or smaller area, at many points and without concentration at any, the cases

¹ For example, in most of the French epidemics, in many of those in the United States and Germany, and in the occasional outbreaks in Spain, England, Ireland, the Netherlands, Norway and other countries.

² In the course of my journey through West Prussia when the disease was prevalent there in the winter of 1863-64, I had many opportunities of ascertaining the truth of that mode of diffusion.

³ See Hirsch (ii), pp. 26, 27.

being numerous or few at each, or merely sporadic.¹ In other instances, again, it would confine itself almost entirely, or even absolutely, to a particular locality or to one group of the inhabitants; the classical examples of that kind of incidence being the military epidemics (to be further discussed in the sequel), and the outbreaks in workhouses, orphanages and other self-contained institutions.

Fourthly, it is very remarkable how different the various epidemics of meningitis have been in their duration and in the number of persons attacked. In many instances an epidemic has been prolonged over several months (three to six) or even over a whole year; in another and rarer class of instances it has lasted only a few weeks. But the extent of the epidemic, or, in other words, the number of cases, has had no definite relation to the period that it covered. Thus, at Versailles and Le Mans in 1840, Toulon in 1838, Cherbourg and elsewhere in France in 1841, Union county, Arkansas, in 1846, Arnheim in 1860, Berlin in 1863-64, and many places in the department of Danzig in 1864-65, the cases were comparatively few, notwithstanding that the epidemic went on for months, or half the year or even the whole year. In other instances, again, the number of the sick has been very considerable, although the duration of the epidemic was very brief. Another noteworthy feature, observed at Geneva in 1805, and subsequently by myself at a number of places in West Prussia in 1864-65, and by Hörschelmann in the Crimea in 1867, is that the epidemic did not, as in the case of other infective diseases that spread epidemically, rise gradually to its highest point and gradually subside towards complete extinction; but a number of persons, various at different places, would fall ill during a few days, the disease would then seem for a longer or shorter time to have ceased, again a series of cases would occur, and the sickness would so proceed with alternating remissions and exacerbations.

¹ Wistrand ('Sundhetscollegii Berättelse för året 1861,' p. 15) has the following regarding this behaviour of the disease in Sweden: "The cases occurred for a number of distinct points within the affected area, and in certain houses or in particular centres." Many cases were reported from Italy, Germany, the United

§ 177. OFTEN CONFINED TO CHILDREN ; OTHER PREFERENCES.

It is a point of interest in the natural history of meningitis epidemica that it has been for the most part associated with a certain *age*, namely, childhood and the prime of life. At the same time, if we compare the several epidemics with respect to the incidence of the malady upon individuals coming within those limits of age, we shall discover very striking differences. In a large number of epidemics, the age of childhood (up to about fifteen years) has suffered almost exclusively: as at Geneva in 1805, Schlettstadt and Aigues-Mortes in 1847, Orleans in 1847, Petit-Bourg in 1848, and in the Irish and Danish epidemics; also those of Massachusetts in 1806, Hardman county, Western Tennessee in 1847, Elmira and other parts of New York State in 1857, Conshohocken, Pa., and Philadelphia in 1863, Illinois in 1864 and Virginia in 1870; together with nearly all the Swedish¹ epidemics and the recent ones in Portugal; also the following in Germany: 1864 at Bromberg,² Stettin and other places of Lower Pommerania, 1865 in the vicinity of Potsdam, at Zellin,³ in the departments of Marienwerder and Danzig,⁴ at Königsberg, in Thuringia,⁵ Hanover, Brunswick, Hesse, Upper, Central⁶ and Lower Franconia (particularly some villages of the Spessart) and Baden;⁷ lastly, in the Greek epidemics, and, it would appear, also those of Hun-

¹ Of 1267 persons who died of epidemic meningitis in Sweden from 1855 to 1860, and whose age is given, 889 were under fifteen years, 328 from sixteen to forty, and 50 were above that limit.

² Of 141 patients, 132 were between two and seven years of age.

³ Of 54 severe cases, 47 were in children under fifteen.

⁴ In the circles of Berent and Karthaus, out of 779 deaths from meningitis epidemica, 737 were in persons up to fifteen years of age, 16 in those between fifteen and twenty years, and 26 in persons over twenty. But the death-rate is not a good measure of the incidence of the disease on the several periods of life, for the reason that children and young persons run greater risk, and the mortality among them is relatively higher.

⁵ Of 180 patients, 160 were not over twenty years old.

⁶ Of 456 patients, 257 were under ten years, 126 from ten to twenty, 41 from twenty to thirty, and 32 over thirty.

⁷ In Rastatt, among 126 cases in the town, 72 were of persons under fourteen years.

gary. It has been much less common for patients of from twenty to thirty years of age to outnumber the children and youths; this happened in the Italian epidemics of 1831-41 and 1845, at Strassburg and Avignon in 1840, at Toulouse in 1842, at Milford, Conn., in 1811-12 (according to Williams), at Montgomery,¹ Alabama, in 1848, in the vicinity of Brookfield, N.Y., in 1857, in Norway in 1859, and during the more sporadic prevalence of the disease at Berlin in 1864-65 and at Munich in 1865. At the more advanced periods of life meningitis epidemica has always been very rare. As a fact agreeing herewith, we may note that the cases in the military epidemics (to be spoken of in the sequel) were mostly in soldiers of the age of eighteen to twenty-four; this is shown by records from Bayonne in 1837, Strassburg in 1840, Nancy in 1841, Douëra in 1845, and Arnheim in 1860.

There are no considerable differences discoverable in the number of cases in the two *sexes*. Nor do the various *races and nationalities*, so far as they have incurred the risk of infection hitherto, appear to be subject to meningitis in different degrees. When it broke out in Algiers, the Arabs suffered from it not less than the Europeans. In several of the United States epidemics the negro race has been visited with particular severity. Of 85 patients treated by Ames at Montgomery, Ala., 23 were whites and 63 negroes; in the New Orleans epidemic of 1850, it was confined to negroes (Fenner); and the same was the case at Memphis in 1862 and 1863, when the disease broke out among the negroes sent there by the Confederates (Morrill). There are other observations on the preponderance of the malady in that race to be found in the accounts of the epidemics of 1862-63 in Mississippi,² of 1864 in Maryland (Baltzell), of 1864-65 at Mobile (Armstrong), of 1867 at Philadelphia (Githens), and of 1873 in South Carolina.³ I think it probable that the reason of this frequency of the disease among negroes is not racial peculiarity but something in their manner of life.

Under ten years, 23 between ten and twenty, 27 between thirty and forty, and 12 above forty.

Med. Assoc., 1878.

Med. Assoc., 1873.

§ 178. USUALLY A DISEASE OF WINTER AND SPRING; SOME EXCEPTIONS.

The area within which meningitis epidemica has been epidemic, or been seen at all, extends in the Eastern Hemisphere from 63° N. (Sweden and Russia) to 30° N. (Jerusalem, Persia, Algiers), and in the Western Hemisphere from 45° N. (Montreal) to 30° N. (Mobile). Hitherto, accordingly, it has been confined really to temperate and subtropical latitudes; it has not penetrated into the cold zone, except to a very slight extent; while the tropics and the whole of the Southern Hemisphere have escaped it altogether.¹ Whether this immunity of the tropics is due to circumstances of *climate*, cannot be decided at present with certainty; although it is so far in favour of that opinion that the disease, whenever it has appeared hitherto, has been influenced by *season* and *weather*. Nearly the whole of the epidemics, in whatever part of the globe they have happened, have been prevalent in winter and spring, or at least have come to a height in those seasons. It is but rarely that the disease has been seen in summer or autumn, and then nearly always in sporadic cases only, the latter point having been very noticeable in those epidemics that lasted into the summer after a commencement in winter or spring.

In Sweden, Norway and Denmark the disease has never occurred as an epidemic except in winter and spring. Of eight Russian epidemics,² one happened during the winter and spring, and five during the spring. The epidemics that have been seen in North and South Germany have mostly happened in winter and spring, and in the few exceptional instances the number of patients has been small. In Austria, Galizia and Hungary it has never occurred except in winter or spring; in Great Britain and Ireland, 11 out of the 12 epidemic outbreaks have fallen in those seasons. Of 63 French epidemics, 24 have occurred in winter, 17 in

¹ I do not consider the accounts of meningitis epidemica in Brazil and Monte Video to be trustworthy.

² The totals that follow will appear small; but for many of the epidemics the period of prevalence is not accurately stated and they are not included.

winter and spring, and 9 in spring. In Italy all the epidemics have been in winter, excepting that of 1843-44 in Sicily, which began in spring and was protracted through the summer. The Greek epidemics have likewise been all in winter; in Asia Minor and at Jerusalem they have occurred in winter and spring. Of the 7 epidemics in Algiers, 4 were in winter and 2 in winter and spring. Of 85 epidemics in the United States, 37 happened in winter, 18 in winter and spring, and 23 in spring.

§ 179. HOW FAR DEPENDENT ON COLD.

The association of meningitis epidemica with these seasons of the year, if not an absolute one, is at any rate remarkably constant; and we are warranted in assuming that the state of *weather* and particularly of *temperature* proper to the seasons has some definite relationship to the origination of the malady.

Some observers, indeed, have laid so much stress upon that point in the etiology that they believe the real cause of the disease should be sought in the action of low temperatures, or of the cold of winter, upon the organism.

It had been pointed out by Vieusseux, with reference to the epidemic of 1805 at Geneva, that the malady disappeared on the approach of mild spring weather. Comte refers the origin of the Grenoble epidemic of 1814 to the fact that the troops were exposed day and night to the fatigues of the service during intense cold. Magail observes that the epidemics of 1845 at Douëra (Algiers) broke out during the prevalence of cold and wet weather, and died out in spring when the thermometer rose as high as 12° to 16° C. (53° to 60° F.). In like manner the Norwegian outbreak of 1859, that of Lyons in 1846, and of Missouri in 1861-62, have been traced (by Arentz, Mouchet and Prewitt respectively) to the direct action of the cold of winter. Love points out that the epidemic at New Orleans in the winter

and to one regiment newly arrived from
quartered in wretched barracks on
and wet clothes to the cold;

whereas the Philadelphia regiment quartered near them, but consisting of troops seasoned to the weather and supplied with woollen clothing, remained absolutely free from the sickness. Dotzauer is constrained to assign the severe cold of the winter of 1865, and more especially the violent chilling winds from the east and north-east, as the true cause of the epidemic in Upper Franconia: it was precisely the places most exposed to these winds that had most of the disease; and the expiring epidemic was kindled into a fresh blaze towards the end of March on the setting in of intense cold. Also Rudnew, Silomon and Zeroni, with reference to the epidemics respectively at St. Petersburg in 1867, and at Bonn and Mannheim in 1870-71, lay special stress upon the causative influence of severe cold.

Against the absolute relevancy of that doctrine, it has to be said in the first place that the disease has occurred in perfectly mild winters: such as those of 1839-40 at Metz, 1839-40 and 1840-41 in Italy, 1862-63 in Indiana county, 1866 in Kentucky; secondly, that it has been prevalent not unfrequently in normally warm spring weather: as at Gibraltar in 1844 and Castres in 1880; thirdly, that the epidemic may not have shown itself until summer: as at Bordeaux in 1839, Toulouse in 1842, Dublin in 1850, and Chrzanow (near Cracow) in 1874; and fourthly, that change of weather has been without effect on the course of an epidemic once it was started, or that the epidemic has even increased with the rise of the temperature: of which there were instances at Nancy in 1841, in Sicily in 1843-44, Massachusetts in 1873 (Upham), Edmondsville, Ill., in 1872 (Armstrong), New York in 1872 (Smith), and Southern Italy in 1874-76 (Borelli). On the first appearance of the disease in Denmark during the very cold winter of 1845, no one hesitated about laying the blame of it upon the intense cold; but when the disease outlasted the winter, and reappeared in the winters following along with much milder weather, it soon became apparent that the original explanation was untenable. The Swedish practitioners experienced the same disillusion, having at first ascribed the malady to the cold weather during the winter of 1855. At Versailles in 1839 there was an exacerbation of the epidemic when the tempe-

rature rose in spring; and we learn from the account by Tourdes of the Strassburg epidemic of 1840-41, that the sickness, after being confined to the garrison throughout the winter, began in March to spread among the townspeople during very warm weather, abated among the garrison in April with a low thermometer, but in the town actually reached its highest point at the time of greatest heat. Levy, after giving figures to show the fluctuations of the disease in the Hôpital Val-de-Grace of Paris from December, 1847, to March, 1849, proceeds to say: "Le froid et le chaud, la pluie et le soleil n'y font rien. Notre statistique générale présente deux maxima qui correspondent aux plus grandes chaleurs de l'été et aux premiers froids de l'hiver." Remy tells us that, at Zellin in 1865, the disease showed a notable remission at the beginning of April, but quickly went up again on the sudden setting in of heat. In Greece the malady broke out in 1868-69 amidst severe cold, continued through the mild weather of spring, and was still causing deaths in a market-village near Nauplia in the month of June with a temperature of 25° C., or 76° Fahr. (Kotsonopulos). When meningitis epidemica was in Asia Minor in 1868-70, it came to an end at Magnesia just when severe cold set in; but it showed itself in Smyrna in the spring under a very high temperature. On comparing the daily mortality from meningitis, during the specially severe epidemic of 1864 in the circles of Berent and Karthaus (department of Danzig), with the temperature of each day so long as the epidemic lasted (January 7th to March 23rd), I am led to the following conclusions: (1) that the malady made its appearance in both circles at a time of comparatively mild temperature (0.3° R. to 4.1° R., say 40° F.); (2) that in the circle of Karthaus the epidemic had one of its maxima between the 12th and 28th of February, which corresponded so far to the very cold days from the 8th to the 17th of that month, but that a second rise in the number of cases took place from the 2nd to the 15th of March precisely at a time when there was a marked abatement of the epidemic in the circle of Berent in the very days (4th to 17th) of the thermometer for

the whole winter were recorded, corresponding to the second maximum in the circle of Karthaus; and (4) that a comparison of the daily temperature with the daily total of the sick does not bring out the slightest correspondence between a particularly low temperature and a particularly high sick-rate or death-rate.

Lastly, in estimating the effect of low temperature or winter cold upon the production of meningitis epidemica, we ought not to leave out of account the fact that centuries had passed, with many cold winters, and no trace of the disease been seen, so far as we know, anywhere on the globe; further that, although the winter cold must have been the same over large tracts of country, it has often happened that only isolated points, a single town or village, had become the seat of the malady; and lastly, that the epidemic has very frequently been confined to a section of the population, not rarely to a small fraction, a class, a particular age, or to one division of troops in a large garrison, although the whole neighbourhood had been exposed to the same influences of the weather.

All these facts show incontestably that low temperature, or any other kind of weather, does not by itself give us the real cause of the disease; that the influence of season upon the production of epidemic meningitis, manifested as it is in the preponderance of the malady during winter and spring, is an indirect influence, that is to say, one that operates either in the way of helping the production of the true pathogenic factor, or of increasing the predisposition of individuals to sicken after a specific manner; or, finally, an influence that works in such wise that the mode of life of the people, modified as it had been to suit the season, will have materially favoured the development of this particular infective disease, just as it has favoured the development of many more.

§ 180. WETNESS OF THE SOIL IRRELEVANT.

Conditions of the soil have been shown to be in every respect irrelevant to the existence and the spread of epidemic

meningitis. The disease has occurred equally in basins, on plateaus, in mountainous country (as in Algiers at elevations of 1000 feet and upwards), on wet ground and on dry; and the range or severity of the epidemic has nowhere brought out any definite relationship to particular kinds of rock. In some quarters stress has been laid for the etiology of this disease, as of others, upon the *marshy nature of the soil*; or, in other words, it has been sought to connect the pathogenesis with the marsh-miasm, a doctrine that was all the more likely to find currency for the reason that the often-observed intermittent type of the disease reinforces the argument for its malarial nature. Thus Gassand is of opinion that one real cause of the epidemic during the spring and summer of 1839 among the troops at Bordeaux would be found in the circumstance that they had been exercised in the early morning on the marshy banks of the Garonne. In a like sense Schilizzi dwells upon the inundations from the overflow of the Rhone, which preceded the outbreak at Aigues-Mortes in the winter of 1841. The point is raised also by Bechet with reference to the disease at Avignon in 1846. De Renzi considers the swampy rice-fields of Southern Italy to have been a real cause of the epidemics of 1839-41. Upham¹ points out that meningitis epidemica broke out among the Federal troops in the winter of 1862-63 when they were encamped on wet or marshy ground in the neighbourhood of Newbern, North Carolina.

Although the fact should not be ignored, that a wet or a swampy soil has a modifying effect upon climate and weather within certain limits, and may thus be able to influence the genesis of meningitis epidemica indirectly; yet we must decidedly refuse to admit any such influence in the sense of a specific marsh-miasm. As the statistics show us, the disease has been as often prevalent on dry, sandy and rocky ground as on a damp and marshy soil. In Algiers it has visited districts such as Douéra, which are prized for their elevated and dry situation (Guyon, Magail); when it was prevalent in 1837 along the valley of the Adour (Dep.

¹ report on the epidemic of 1873 in the State
opinion that circumstances of locality

Landes), it affected the villages in dry and lofty positions as well as those on low and swampy ground (Lespés); and the same fact was noted in the epidemic of 1864 in the Neissethal (Silesia), in that of 1864-65 at Nentershausen (Electoral Hesse), 1868-69 in Greece, 1866 in Breckenridge county, Ky., and 1857 near Brookfield in New York State.¹ Indeed, during the epidemic at Zellin in 1865, the disease spared nearly all the houses close to the Oder, having been almost confined to that part of the village which is situated on dry ground about 150 feet above the level of the river. Again, the epidemic of 1849 at Millbury, Mass., was almost limited to the streets nearest to the Blackston river; whereas in the neighbouring town of Sutton the high and the low streets were affected equally (Sargent). When the disease overran Montgomery, Alabama, nothing whatever was discoverable in the conditions of the ground which could serve to explain why some plantations were attacked while others escaped (Ames). With reference to this question in Sweden, Lindström says: "The disease in this country has been equally prevalent on the coast and in the interior, on the elevated plains and in the marshy valleys of rivers." In my own experience, the epidemic in the department of West Prussia was not less widely diffused (and in some instances more widely) on the sandy and peaty soil of the hill-districts, than on the wet clay or humus-covered alluvium of the lower levels. Frothingham remarks that, when the disease broke out in the winter of 1861-62 in the army of the Potomac (close to Washington), only one regiment was touched by it, and that regiment the only one in the whole army which was camped on particularly wholesome and dry ground; among the rest of the troops, who were less favorably located, agues were general, but there was no cerebro-spinal meningitis. How little a marshy soil has to do with meningitis epidemica is further shown by the fact that in France, one of the countries most subject to the disease, it is precisely the great marshy districts that have

¹ Stillé (l. c., p. 95) says, with reference to the experience of the United States: "Localities of every sort, high and low, dry and moist, those saturated with marsh miasmata, and those favoured by the pure breezes of mountain districts, have been alike invaded by epidemic meningitis."

been least touched by it, and by the other fact that the malady has mostly broken out and been prevalent during the winter, or that season of the year when the influence of the marsh, in the ordinary sense of the term, can be least thought of.

§ 181. REMARKABLY FREQUENT AMONG SOLDIERS IN GARRISON; ALLEGED INFLUENCE OF FATIGUE.

Relationships like those which are found to obtain between epidemic meningitis and the influences of the season, may be discovered also between it and certain *modes of life* and *hygienic circumstances* of the individual. It is true that, on a wide survey, no class of the people has enjoyed immunity from the disease; that it has had its victims in the mansions of the rich as well as in the dens of poverty and misery; that, in certain instances, such as the epidemic of 1868 in the Crimea and that of 1873-74 at Thisted in Jütland, it was actually the well-to-do classes that suffered most. None the less a close scrutiny of the facts brings out a very marked preference of the malady for certain circles characterised in some special way by environment and social position; it shows that the disease clings to certain groups of the people, or to certain tenements, where the hygienic conditions are unfavorable.

Epidemic meningitis among soldiers.—That peculiarity in the distribution of the disease comes out most of all in its *predominance among the military*, and especially among troops in barracks. So much has that been the case that, in many of the epidemics, the soldiery alone (and in fact the lower grades only, to the exclusion of the officers) has been affected, or at all events has furnished the largest contingent of the sick. Of 62 epidemics in France, the malady in 43 was absolutely confined to the soldiery of the place, in 6 it was chiefly among the troops and only in occasional cases among the townspeople, and in 5 it was equally common among the townspeople. In Algiers, 4 out of 9 epidemics were confined to the soldiery alone, and 4 were among them only. From the United States

we have numerous accounts of the disease being restricted to the military, especially during the Secession War in 1861-63.¹ One of the only two epidemics in the Netherlands, that of 1860 at Arnhem, was entirely within the garrison of the place. In the epidemic of 1863-64 at Berlin, the malady was for a considerable time in a single regiment, and even to the end most of its victims were among the military. When the disease was in Ireland in 1845 and 1867, its distribution was principally among the troops.

A noteworthy fact in these military epidemics is that the disease in many instances did not extend beyond one barrack or one division of the troops. Thus, in the epidemic of 1839 at Versailles, 116 cases in a total of about 160 occurred in the 18th regiment of infantry, the rest being distributed over four other infantry regiments and three divisions of cavalry. At Brest in 1840 and 1841 the malady was confined exclusively to the barracks of the marines. In the Marseilles epidemics of 1841 and 1842 it occurred in the 62nd regiment stationed in the north of the city, while the 20th regiment garrisoning the southern quarter remained quite free from it. At Nantes in 1842 the disease existed only in the barracks of the Lancers; at Lyons the same year only one regiment had it; and in subsequent epidemics there (1846-47), while the infantry suffered to a considerable extent, there were no cases among the artillery. On the other hand, at Metz in 1841 and Grenoble in 1848, it was chiefly the artillery that suffered, the infantry remaining almost absolutely free from it. In Portugal (1861 and 1862) the cavalry furnished the largest contingent of the sick, the infantry having a much smaller number. At Avignon a single regiment had 46 cases, while all the rest of the garrison had only 18. At Orleans in 1847 there were 11 cases among 500 men of a regiment quartered in the St. Charles' barracks, and 9 cases among the rest of the troops numbering 1000. In the epidemic of 1848 at St. Etienne, there were two squadrons of cavalry and 1100 foot soldiers in one of the barracks

¹ See the papers by Prewitt (Livingston county), Armstrong (Mobile), Gerhard (Norfolk, Va.), Upham (Newbern, N. Car.), Frothingham and Woodward (Washington). The disease had been epidemic in a regiment in garrison near New Orleans as early as 1847.

without a single case ; whereas in the 22nd regiment, 1100 strong, there were 107 cases and 30 deaths. At Setif in Algiers in 1868, only a single company of Algerian tirailleurs suffered ; at Cherbourg in 1882, only a single division of marines. In the epidemic during the winter of 1862-63 among the Federal troops around Newbern, N. Carolina, the malady was almost confined to four of the regiments. In the small military epidemic at Berlin in 1864, 12 out of the total of 14 cases were in the barracks of the Alexander regiment, and the other 2 in that of the 2nd regiment of the Guards ; while the rest of the garrison, so far as is known, escaped altogether.

Corresponding to this limitation of military epidemics within particular barracks, the disease among the townspeople has been confined, over and over again, to particular self-contained institutions or corporate groups ; or there have been merely casual cases outside those limits. That fact comes out most decidedly in the Irish epidemic of 1846 (at Bray, Dublin and Belfast), in which the disease would appear to have been in the workhouses only. With it we may class the epidemic of 1848 at Petit-Bourg, where the meningitis occurred almost exclusively among the pupils of the " colony." To the same group of instances belong the isolated outbreak in the bagnio of Procida in 1839, and in that of Rochefort in 1838 ; in the latter the sickness was almost limited to the convicts and attendants in the prison, although a few cases were seen among the soldiers in the arsenal and among the townspeople. Other instances are : the epidemic of 1849 in the La Force prison, Paris ; 1863 in the orphanage of Vienna, and at the same time in the Marine College of Newport, R.I. ; 1863-64 in an educational institution at Philadelphia (according to Atlee) ; 1864 and 1865 in the orphanage and in two hospitals at Washington ; and 1846 at Philippeville, where the disease was for the most part among Maltese labourers, the sardine fishers escaping altogether, and only occasional cases occurring among the population at ' .

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Vieusseux for Geneva, Schilizzi for Aigues-Mortes, the authorities for Sweden, Hanuschke for the Neissethal, Remy for Zellin, the Bavarian authorities for Central Franconia, and by myself¹ for the epidemic of 1864-65 in the department of Danzig (especially in the circles of Berent and Karthaus), the number of cases in certain families, houses, or groups of houses has been so large as to constitute them, in a sense, small epidemic foci.

§ 182. EFFECTS OF FATIGUE.

In a certain number of the epidemics that have been confined to the military (such as those of 1839 at Versailles, 1840 at Strassburg, 1847 at Orleans, 1848 at St. Etienne, 1845 at Dublin, 1861 and 1862 in Portugal, 1860 at Arnhem, and 1847 at New Orleans) the earliest cases, and the majority of the cases throughout, occurred *among recruits*. It was natural to seek for an explanation of the fact in their altered mode of life, and more especially in the unwonted *bodily strain of their drill* or other duties of the service. Some observers, such as Rollet² have gone so far as to make that factor the true and only cause of the disease. Other observers, such as Tourdes, Mahot, Corbin and Poggioli, have been less one-sided in the importance that they have assigned to these exactions of the service; and there can be hardly any doubt that they have had some effect in calling forth the disease, and that they serve to explain, in part at least, its preference for recruits. The supposition is made all the more tenable by the fact that the same harmful influences have made themselves felt under other circumstances, that is to say, among seasoned soldiers;³ and in

¹ See Hirsch, ii, in list of authorities.

² "Les fatigues musculaires répétées périodiquement depuis plusieurs jours," he says, "et le refroidissement succédant à un violent exercice, ces circonstances apparaissent d'une manière si constante, qu'il est impossible de ne pas insister sur le rôle, qu'elles jouent dans la production de la maladie, qui nous occupe; ce sont elles, qui en expliquent le développement de la manière la plus satisfaisante."

³ Thus Comte informs us that most of the patients in the epidemic among the military at Grenoble in 1814 belonged to the "army of Mont Blanc," who had undergone excessive fatigues in marching day and night. Chauffard also points

fact it has sometimes been practicable to make the epidemic decline by eliminating that cause, or in other words, by lightening the men's duties (Tourdes). But the particular opinion adopted by Rollet is opposed by the fact that the disease, although it had attacked the recruits first, has subsequently spread over the whole garrison, or extended at any rate to detachments of seasoned troops (Frankl, Tourdes, Corbin); and also by the fact that in other epidemics, as at Lille in 1848, Douéra in 1845, in the Berlin garrison¹ in 1864, and at Bordeaux in 1867, the persons attacked were mostly those who had been a considerable time in the service and in whose case there was not the smallest reason to allege any unusual or excessive degree of fatigue at the time of the outbreak or previously; and lastly that soldiers, recruits among the rest, have been at all times subjected to such fatigues of body, although meningitis epidemica in former centuries had not been seen among the military, and has been seen but little in recent times, even in the French army which has suffered most from it, while in most European armies it is still quite unknown.

§ 183. INFLUENCE OF OVERCROWDING AND OTHER INSANITARY CONDITIONS.

It is clear that the significance to be assigned to that factor in the etiology is only that of a predisposing cause or an opportunity. It is much more reasonable, in my view, to connect the prevalence of meningitis epidemica among bodies of troops with their lodgement in more or less *crowded, badly kept, and insufficiently ventilated* tenements, or, in other words, with the same conditions that afford a peculiarly favorable soil for the development of this and many other infective diseases in other classes than the military—not merely in workhouses, prisons and the like, or in the homes of the poor, but even in the ill-chosen bedrooms, the dull nurseries, and the like of the well-to-do classes, not out that the persons attacked in the Avignon epidemic of 1840 were chiefly those who had had severe tasks imposed on them.

¹ Of 14 patients treated by Fräntzel, 4 had served only six months, 2 a twelve-month, and the rest between two and five years.

excepting those of them who reside in palaces. The first writer, so far as I know, to point out the causal connexion between these defects of hygiene and the origin of meningitis epidemica, was Gasté; in treating of the outbreak of the disease in the garrison of Metz during the winter of 1839-40, he traced it to the over-crowding of the barracks at the time, and he did in fact produce an abatement of the epidemic by getting some of the troops sent elsewhere, and in that way making a partial clearance of the infected rooms. Observations of the same kind were made at Versailles in 1839, at Perpignan in 1840-41, at Strassburg in the same season, at Nantes in 1842 and at Orleans in 1847; so that it may be said that the great majority of the French military surgeons, both in France and in Algiers, came at length to pronounce in favour of the doctrine that overcrowding of barracks was one of the most material factors in the epidemics of cerebro-spinal meningitis observed therein, or, in so far as such establishments were concerned, that it was the only discoverable cause.

"Le point de départ de l'épidémie," says Tourdes with reference to the epidemic of 1841 at Strassburg, "me paraît évidemment résider dans l'encombrement. C'est dans une caserne où de nombreuses recrues sont accumulées, que la maladie éclate, et elle y sévit avec force jusqu'au moment où l'autorité prescrit la salutaire mesure de sa partielle évacuation; la maladie s'y éteint brusquement, et les militaires détachés cessent bientôt de fournir des victimes. La même cause existe dans les autres casernes, qui toutes renferment un notable accroissement d'effectif." "La cause principale à nos yeux," says Corbin in summing up his experience of the epidemic at Orleans in 1847 "(et en cela nous sommes d'accord avec M. Tourdes, avec M. Gasté et avec la plupart des médecins militaires), c'est l'encombrement, ce qui suppose l'altération de l'air, combiné quelquefois pour le soldat avec des habitations malsaines et souvent, pendant l'hiver, avec une température trop élevée dans les corps de garde ou dans les quartiers."

That doctrine finds strong support in the fact uniformly observed, that the disease has never been seen except in casual cases among those officers of the affected corps who lived outside the barracks, as well as among the non-commissioned officers and bandsmen, who were better lodged. Another confirmation of it may be inferred from the military epidemics that have occurred in other countries: as

in the outbreak among the United States Federal troops at Newbern in 1862-63, when the disease was epidemic only in those regiments that were quartered in crowded and ill-ventilated barracks; or in the small military epidemic of 1865 at Berlin,¹ of which we read: "The first case occurred on the 9th of February, the Guards having begun to absorb their reserves from the 25th of January onwards (the Alexander regiment, for instance, rose from 2108 to 3182 men). That circumstance appears to have had a really injurious effect; and it makes it probable that the cause which we, as well as the French, have chiefly to blame is over-crowding of the barracks."

In agreement with that opinion of military practice is a great number of observations that have been made on the general diffusion of the malady in villages and towns at large. In many of the epidemics the sway of the disease hardly extended beyond the inhabitants of narrow, filthy and badly aired streets; and even in those purlieus it was the poverty-stricken inmates of densely-packed houses that supplied by far the largest contingent of the sick. Thus, in many of the French seats of the malady, such as Rochefort, Versailles, Toulon, Strassburg and Aigues-Mortes, not a single case has been seen among the well-to-do section of the inhabitants; in Geneva also the epidemic appeared first among the poor; in Gibraltar it was likewise the proletariat that suffered, especially the poverty-stricken Portuguese; again in Italy, of which we read: "*La maladie atteignait des populations pauvres, entassées quelquefois pendant l'hiver pêle-mêle avec les bestiaux*;" further in Sweden, many parts of Germany (1863-64 in the Neissethal, 1864-65 in the department of Danzig,² 1869-70 at Königsberg,³ and 1870-71 at Bonn), Galizia and Poland in 1879-80, Nauplia in 1868, New York⁴ in 1872, and Castellana in 1874.

Those are also the circumstances that mostly conduce to the development of the small disease-foci, of which I have already given an account from my own observations and those of others. They seem to me to explain also the remarkably frequent occurrence of the disease among negroes

¹ Fräntzel, l. c., p. 228.

² Hirsch (ii), p. 135.

³ All the cases except one were among the poor.

⁴ Morris, Smith.

in the United States ; and, in part at least, its prevalence at those seasons of the year in which the bad weather keeps people crowded together within doors in small and filthy rooms made as weather-proof as possible, and deprived of all ventilation, being the seasons, therefore, in which the defects of hygiene would make themselves chiefly felt.

That the element in the etiology here discussed does not of itself constitute the true morbid factor, goes without saying. Apart from the consideration that, if hygienic defects of the kind referred to could generate the disease, it would not only have been prevalent at all times, but would have been much more widely spread over the globe ; we have evidence that meningitis epidemica has, on the one hand, broken out not unfrequently among townspeople and soldiers, in barracks particularly,¹ under circumstances in which these noxious things were excluded or at all events not discoverable, and, on the other hand, that it has often been confined within narrow limits, although the defects of hygiene have been as great round about as in the affected spots themselves. So that this factor also has no specific significance for the origin of meningitis epidemica, but only a general one, the same general significance that it has for many other infective diseases in respect of affording them a peculiarly favorable soil wherein to develop.

§. 184. CONFORMITY OF TYPE DUE TO A SPECIFIC MORBID POISON.

"L'étiologie de cette affection," says Chauffard in his excellent account of the Avignon epidemic of 1840, "est restée enveloppée d'ombres impénétrables." A period of forty years, rich in experiences of epidemic meningitis, has elapsed since then, but the "impenetrable cloud" which

¹ According to statements by Levy for the Paris epidemic of 1847, by Maillet for that of Lille in 1848, and by Massonnaud for that of Castres in 1880, the troops that exclusively suffered from the disease, or, at any rate, that suffered principally, were those quartered in barracks whose hygiene left nothing to be desired. In the epidemic of 1848 at St. Etienne the over-crowded barracks were almost exempted, the disease having been mostly among recruits who were thoroughly well lodged.

hangs over its mode of origin has not lifted in the smallest degree; so that at the present day, although we have a larger body of observations at our service than Chauffard and his contemporaries had, we can do no more than make conjectures according to the suggestions of the natural history. The doctrine that we seek to establish is that the disease depends on a *process of infection*, or, in other words, that it owes its origin to the working of a *specific morbid poison*.

Here is a disease, unknown in former centuries or at all events very rarely seen, which has come to epidemic diffusion in recent years, not only in certain places and circles, but throughout wide tracts of country; nay it has broken out as a disastrous national sickness almost at the same moment at the most diverse points of two continents. In its outbreaks, its prevalence, its intermissions and disappearances for a time from the regions of its visitation, the disease has shown so slight a dependence, and that too so casually, on any concurrence of atmospheric, telluric or other influences in the lives of individuals, that it is impossible to refer the origin of it to the effects of one or more of these. In view of the facts we are constrained to assume, as the proper cause of the disease, some such pathogenetic factor as would have a specificity corresponding to the perfectly uniform type of the morbid process. This virus must correspond to a clinical form of disease which has been always the same, barring small and unimportant features, whether the scene of its outbreak and progress has been the banks of the Vistula or of the Mississippi, the slopes of the Hercynian Mountains or of the Atlas, the interior of Sweden or the shores of the Mediterranean, the soil of France or of the North American prairies, or wherever else the malady has been studied.

Further evidence for the infective nature of the epidemic, or for the general diffusion of something that can cause an infective disease, is afforded by those epidemics of meningitis in which a certain proportion of abortive cases are observed side by side with cases of the fully-developed disease; as well as by the fact that the disease, although it is essentially a local one in the body, is still dependent on a

constitutional process, which shows itself in the outbreak of an exanthem of various type, more especially in the truly pathognomonic herpes, in the occurrence of parotid swelling, sometimes in swelling of the spleen, in the muscular degeneration which is so characteristic of an infective disease, in the peculiar post-mortem alteration of the blood which is constantly found, just as in typhus and the acute exanthemata, in the hæmorrhages, ecchymoses into the subcutaneous tissues and upon the serous and mucous membranes, that are doubtless associated with the former, and most of all in the fact that the cause of death in cases with an excessively rapid course cannot be explained by any anatomical changes of the organs, or of the central nervous system in particular. As Wunderlich says, there is, beyond and behind the changes of tissue, another important although unknown factor, which acts in such a manner as to justify the designation of "morbid poison" being applied to it.¹ We have already seen in what way external factors, such as season and weather, time of life and bad hygiene, affect the occurrence and spread of epidemic meningitis, perhaps also its type and result, just as they affect other infective diseases.

§ 185. SEARCH FOR THE VIRUS.

It is a probable supposition that this specific morbid poison is an *organic substance*; and there has been no lack of research to trace the same in the bodies of the sick, or to find it in the products of the disease after death. The results of these inquiries, however, so far as they have yet gone, are not entitled to more than a very qualified credit.

Gaucher² found a great many micrococci in the urine and blood of a patient suffering from meningitis epidemica, as well as in the exudation into the pia mater of the brain and spinal cord on post-mortem examination; but the case is defective as evidence on account of the obviously

¹ "The outward demonstrations of the disease," says Upham (i), "if carefully studied, would seem to be rather the results of some subtle agency that had suddenly overwhelmed with its depressing effects the vital powers, than the excited and painful expressions of active inflammation."

² "Gaz. méd. de Paris," 1881, Mars.

imperfect technique used by the observer. Of equally doubtful value appears to be the paper of Ughetti, who also found micrococci in the exudation and in the blood, these, according to his own admission, having nothing remarkable in their form or other characters; attempts to infect rabbits by means of fluid containing the micrococci led to nothing. Quite recently Marchiafava and Celli have announced that they also have succeeded in finding micrococci in subjects examined soon after death from epidemic meningitis; the organisms were in the intercellular fluid and in the substance of the colourless corpuscles within the affected parts, but not often in the endothelial cells.

The significance of these microscopic discoveries remains an open question. But peculiar and specific properties must be assigned to that which produces the disease, that is to say, to the morbid poison; and all the earlier attempts to connect the pathogenesis of meningitis epidemica with the morbid poison of the *malarial diseases* or of *typhus exanthematicus*, or, in other words, to represent it as a modification of one or other of these morbid processes, must be set down, according to my own view formerly expressed¹ and in the judgment of nearly all the more recent observers, as erroneous.

§ 186. NOT CONTAGIOUS BUT TRANSPORTABLE.

Connecting with the doctrine of the infective nature of epidemic meningitis, is the question of its *communicability* or *contagiousness*. Most observers have answered it quite decidedly in the negative, on the ground of their experience that those who had come into close and continuous contact with the sick, such as medical attendants and nurses, had been very rarely attacked, and that patients suffering from it had been admitted into the wards of hospitals without any extension of the disease to the other patients ever taking place. On the other side there are facts that tell in favour of communicability, the most notable of them being the observations that were made in the epidemics of 1837-40. In these epidemics the disease would seem to have been transported by infected troops from place to place, some-

¹ I have discussed this question fully in my monograph on Meningitis epidemica (Berlin, 1862, pp. 141—148).

times even to distant garrisons, where it did not confine itself to the division of troops originally infected but spread in epidemic form to other regiments, and, in a few instances, even to the townspeople. Thus, in 1837 it came first to Rochefort, and afterwards to Versailles, with a regiment which had suffered from it at Bayonne. The two former places had hitherto been free from meningitis epidemica; but after the arrival of the troops the disease became epidemic and clung to the garrison for the next two years. In 1840 it broke out among the garrison of Laval, whence it came to Le Mans and Château-Gonthier through detachments of troops. In 1847 it appeared at Bourges among a battery of artillery, and was brought by the latter to Metz, where it spread to other troops in the garrison. A very remarkable outbreak is that which took place in Algiers in 1840, a season when the disease was more than usually prevalent among the troops in France. Algiers is the only spot on African soil where the malady has ever been seen; it is in intimate relations with France; and importation of the disease is made all the more credible by the fact that its first appearance there was among the French troops, with subsequent extension to the civil residents. Also with respect to the epidemic of 1864-65 in the hospitals of Washington, Horner suggests in his report upon it that the disease had been introduced from the seat of war. In the epidemic of 1865 in West Prussia, several cases came to my own knowledge, which might very well be taken as showing transmission of the disease from place to place; and some other observers express themselves more or less decidedly of that opinion, including Fräntzel for Berlin, Baxa for Pola, de Moulon for Trieste, Pabst for Königsberg, and Frew for Galston. Without wishing to lay too much stress on these facts, I still think that they suffice to keep the question of the communicability of meningitis epidemica an open one. But in respect to the manner of its ultimate communication, I am constrained to adopt the view of Mistler, who points to the observations made among the French troops and says:

"Il est donc évident qu'il faut reconnaître une cause productrice spéciale; je l'attribue non pas à la contagion proprement dite, attendu

que je n'ai pas observé le moindre fait positif qui milite en sa faveur, mais à un principe morbide épidémique, qui s'attache soit aux hommes, soit aux effets d'un corps d'armée, ou à des régimens détachés."

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CHAPTER XIX.

NEGRO LETHARGY.

(SLEEPING SICKNESS, MALADIE DU SOMMEIL, HYPNOSIE, SOMNOLENZA, LALAREGOLO, NELAVANE.)

§ 187. SYMPTOMS AND MORBID ANATOMY.

About the beginning of this century attention was called by Winterbottom, a surgeon in the British service, to a disease of the natives along the Bight of Benin, which consisted in a peculiar state of lethargy and was always fatal sooner or later. Our more precise information about the malady dates from 1840, when Clarke published the observations that he had made of it in Sierra Leone. The lethargy subsequently became the subject of a large number of inquiries by English and French practitioners;¹ and although they have not gone very deeply into the causes

¹ Abblart, 'Arch. de méd. nav.,' 1883, Dec., 456; Ballay, 'L'Ogoué, Afrique équatoriale occidentale,' Par., 1880, 45; Bestion, 'Arch. de méd. nav.,' 1881, Nov., 409; Carbonel, 'De la mortalité actuelle au Sénégal, &c.,' Par., 1873; Chassaniol, 'Arch. de méd. nav.,' 1865, Mai, 509; Clarke, 'Lond. Med. Gaz.,' 1840, Sept., 970; also in 'Edin. Monthly Journ. of Med.,' 1842, April, 320, and 'Transact. of the Epidemiol. Soc.,' i, 116; Corre, 'Gaz. med. de Paris,' 1876, Nr. 46, 47, and 'Arch. de méd. nav.,' 1877, Avril, 292, Mai, 330; Dangaix, 'Moniteur des hôpit.,' 1861, Nr. 100; Dumontier, 'Gaz. des hôpit.,' 1869, Nr. 120; Gaigneron (according to the references of Dutroulau, 'Traité des maladies des Européens dans les pays chauds,' Par., 1861, 101, and Boudin, 'Annal. d'hyg.,' 1862, Jan., 75); Gore, 'Brit. Med. Journ.,' 1875, Jan., 5; Griffon du Bellay, 'Arch. de méd. nav.,' 1869, Jan., 73; Guérin, 'De la maladie du sommeil,' Par., 1869; Iglesias y Pardo, 'Observ. teorico-prat. sobre las fiebres Africanas de Fernando Pó,' Ferol, 1877; Nicolas, 'Gaz. hebd. de méd.,' 1861, Oct., 670; Ogle, 'Med. Times and Gaz.,' 1873, July, 6 (information supplied by McCarthy); Ribeiro, as quoted by Ullersperger, 'Monatsbl. für med. Statist.,' 1871, Nr. 12; Ritchie, 'Edinb. Monthly Journ. of Med. Sc.,' 1852, May, 414; Santelli, 'Arch. de méd. nav.,' 1868, Avril, 311; Winterbottom in Simmons, 'Med. Facts and Observ.,' 1800, viii, 56.

and nature of this highly peculiar malady, their researches serve to show that its area of distribution includes the greater part of the West Coast of Africa, and that it is strictly confined to the negro race.

Clinical characters.—The onset of the distinctive morbid phenomenon, a state of lethargy or reverie, is often preceded for a considerable time by a series of prodromal symptoms which are so characteristic that those in the individual's company are never deceived as to the fate in store for him. He complains of weakness, especially after considerable exertion, of low spirits, disinclination to work, pain or a feeling of weight in the head, and giddiness. He has a desire to give himself up to repose at other than the usual hours, seeking out some solitary and quiet spot wherein to pass the time half asleep. Although he may strive against that disposition with all his might he cannot altogether conquer it, and it is only amidst the livelier kinds of excitement that he is able to remain brisk. His gait at the commencement of the malady is still firm, although he is easily tired; but as the disease proceeds and the lethargy becomes overpowering, he goes about with his eyes half shut and his walk becomes unsteady like that of a person in drink. There are no disorders noticeable in the other functions so considerable as to suggest a profound and mortal disease; unless it be a lowering of the body temperature, which makes the patient feel the need of warmth and causes him to sit in the sun, together with a certain degree of slowness and sometimes irregularity of the pulse. In severe cases there is an evening rise of the temperature to 38.5° C., or even above 39° C. (100° to 102° F.), with a quick pulse (Corre). The patient's sensory perceptions as well as his intellectual faculties are quite unimpaired; if he is not talkative, he answers promptly and intelligently when spoken to. As the disease progresses his expression betokens dulness of thought; his gait becomes slow, uncertain and tottering, although, when he is thoroughly interested, he can still execute any sort of movement. Meanwhile the somnolence has increased so much that he can hardly control it; it becomes difficult to rouse him, and not unfrequently he falls into a lethargy in the midst of the loudest noises or over his food. "J'ai vu le malade, que je pressais de boire," says Nicolas, "essayer de porter le verre à sa bouche, et s'assoupir avant d'avoir achevé ce mouvement si simple"; and Gore quotes the following remark by Ferguson: "I have seen the subject of a case lying fast asleep with a mouthful of half-chewed victuals in his cheek; he had, in fact, fallen fast asleep while eating his dinner." Concerning the nature of this somnolence, Corre has the following: "La somnolence, exceptionnellement poussée jusqu'au coma, rarement continue, n'est pas rigoureusement constante. Tous les malades atteints de nélavane ne dorment pas; beaucoup demeurent couchés, les paupières fermées, demi-occluses, ou complètement ouvertes, mais sans autre séparation d'avec le monde extérieur qu'un profond indifférentisme. Il est à remarquer que la

plupart des malades véritablement somnolents nient le sommeil quand on les interroge : on ne les a pas plutôt quittés qu'on les aperçoit étendus dans un coin de cour ou de case."

Apart from a more or less considerable loss of the sense of touch, which serves to explain also the uncertainty in the movements, especially those of the upper extremity, there is no sensory disorder noticeable. Sometimes the memory is slightly impaired, but in other respects the faculties of the mind are intact. In many cases convulsive movements occur, without loss of consciousness, or it may be merely slight choreic movements; these are followed by temporary contractures or paralysis of certain parts, and in most cases by an increase of the lethargy. When the latter is very profound there may be involuntary evacuation of the feces and urine. Even when the disease has made great progress there is nothing abnormal to be noticed in the vegetative functions of appetite, digestion and nutrition. The stools are mostly without colour, as they are apt to be in negroes even in a state of health; the urine contains no precipitate, is of clear colour, and free from albumen. It is not until the disease has reached its acme that the patient begins to waste; at the same time the pulse becomes slow and small, the skin assumes a dried-up, earthy, or ash-coloured appearance, sometimes there is slight œdema round the ankles (but never dropsy fully developed), the drowsiness becomes continuous, increasing gradually to a profound coma, and life goes out for the most part very quietly but sometimes in a paroxysm of convulsions. Intercurrent disease, such as dysentery or pneumonia, may hasten the fatal issue, which would seem to be in any case almost inevitable. Of 179 negroes suffering from lethargy, who were under treatment by English practitioners on the Sierra Leone coast during eleven years (1846-50 and 1859-66), the disease had proceeded to a fatal issue in 132. The duration of it (not counting the prodromal stage, which is often very protracted) is from three to twelve months or even longer.

Morbid anatomy.—The inspections of the dead bodies made hitherto, and not very carefully made, have failed to reveal anything definite about the anatomical nature of the disease. Guérin made twenty-three post-mortem examinations, and in nearly every case found the cerebral sinuses and the meningeal vessels full of blood and dilated; in three cases slight increase of the cerebro-spinal fluid, which was clear; the ventricles always normal, and occasionally a small amount of serum in them; in one instance slight serous infiltration of the subarachnoid space at the base of the brain; never any trace of acute or chronic inflammation of the membranes; the brain-substance always of normal consistence, with no trace of softening or other morbid change, *puncta cruenta* seldom numerous in the cut surface of the cerebrum; in one case (where death followed an apoplectic stroke) the membranes much injected and a small spot of apoplexy, all other organs perfectly normal; in one case dropsical effusion into the serous spaces and subserous tissue.

Corre describes a dissection in which there was likewise much hyper-

æmia of the sinuses and vessels, vascularity of the brain-substance (particularly the cortex), its consistence normal apart from extreme hyperæmia and softening of the corpus striatum and slight softening of the thalami, a small quantity of rather turbid fluid in the ventricles, with here and there an obvious thickening of the ependyma; the thoracic and abdominal organs perfectly normal. Griffon de Bellay also examined one cadaver and found the brain-substance and membranes congested, many *puncta cruenta*, and the pons softened. In a case of Gore's the membranes were congested, the brain healthy but anæmic, about a scruple of serum in the ventricles; the thoracic organs quite healthy; several ecchymoses at the pyloric end of the stomach, the intestine for about three feet deeply congested and contracted, and with a considerable quantity of thick bloody fluid inside; liver, spleen, and kidneys normal. In one of his dissections, Dangaix found the brain-membranes injected, a large quantity of flocculent fluid in the arachnoid space, exudation on the vertex, the cerebral substance very vascular and rather soft. In a second case (very imperfectly examined), the sinuses were distended, there was a small quantity of serum in the ventricles, and the substance of the brain and of the cord as far as the cervical enlargement was of strikingly firm consistence. In a third case, besides hyperæmia of the membranes, the serous exudation into the arachnoid, and thickening of the latter with an exudation on the surface at a few spots, there was red softening approaching to liquefaction in the pons, thalami, and corpus callosum; thoracic and abdominal organs normal, excepting the liver which was somewhat enlarged.

Clarke gives the results of five dissections. There was in all of them extreme hyperæmia of the brain-membranes; in two there was opacity and thickening of them; in one a serous exudation into the arachnoid mesh-work; in one the cerebral substance anæmic, while in two others it was highly congested; in two a slight amount of serum in the ventricles; in one the ventricular serum tinged with blood; in one the corpora striata and thalami softened; in most of them the membranes of the cord congested; in two a large amount of blood extravasated in the cervical and dorsal regions of the spinal canal, and exudation besides in one of them; in three (boys from ten to fourteen years old) much fat on the surface of the heart, in one of them with excentric hypertrophy; in one case the latter condition without fat on the surface; nearly always certain appearances of pleurisy, and in two cases indications of pneumonia; in the majority, congestion of the gastric mucous membrane, of the peritoneum, and of the cortex of the kidneys.

Lastly, a fact adduced by Corre and Gore should be noted, namely, that in persons attacked by lethargy, and even before the disease was developed, enlargement of the lymph glands was relatively common, if not altogether constant, although its extent was very slight. Corre lays particular stress on this in his view of the pathogenesis, as we shall see.

§ 188. AREA OF DISTRIBUTION.

The *distribution-area* of negro lethargy includes a large part of the West Coast of Africa between the Senegal and the region of the Congo; there is no mention of it in the writings relating to Angola and Benguela, situated to the south of the Congo, and it probably does not occur in these territories. On the coast of *Senegambia*¹ the principal seats of it are the districts of Baol and Sin, especially the settlements of Portudal and Joal (Corre); it has been seen also on an island in the estuary of the Rio Grande, belonging to the Portuguese settlements (Gore). Of its occurrence in *Sierra Leone*,² we have accounts by Clarke and Gore. The former says that it is more common among the tribes belonging to the interior than in natives of the coast; he speaks of it also among the free negroes of Cape Mesurado in *Liberia*. We hear of cases among the Kroomen on the *Spice Coast* and *Ivory Coast* (Santelli), among the natives of the *Gold Coast* (Clarke), on *Fernando Po* and other islands in the Bight of Biafra (Ritchie, Iglesias y Pardo), in the region of the *Gaboon*, not merely on the coast (Dumontier), but also in the interior chiefly along the course of the Ogooué (Ballay), and finally on the *Congo Coast* (Dumontier, Griffon de Bellay). Wherever the disease has occurred beyond those regions, it has been only in negroes imported from the West Coast, as in the *French Antilles* (Guadeloupe and Martinique). Among 1200 negroes who came under his observation during nine months, Nicolas saw five cases; he thinks that one in every hundred deaths among negroes on the voyage from the Congo to the West Indies is from lethargy, and that if the disease be commoner among negroes in their homes than under these circumstances, the reason would be that those of them who show the first or prodromal signs of the disease are left behind. During twelve years' practice in Martinique Guérin saw 148 cases among imported negroes. Under similar circumstances the malady has been

¹ See the papers by Chassaniol, Gore, Corre, Bestion, Carbonel and Abblart.

² The frequency of the disease in Sierra Leone is shown by the fact that 179 cases came under treatment by English practitioners in eleven years.

seen among negro soldiers in the *Bahamas* (Gore), and among negro labourers in *Brazil* (Ribeiro).

§ 189. PURELY A DISEASE OF NEGROES, MOSTLY IN THEIR NATIVE COUNTRY.

The disease has been found only in *negroes of pure blood*, with two exceptions, one a case of a mulatto reported by Chassaniol, and the other of a Creole negro boy reported by Clarke. It has never been seen in other coloured races or in Europeans. As regards its occurrence in negroes away from their native country, Nicolas says that it does not originate in the blacks born in Martinique, but that a few cases of it have developed in negroes imported into the island, and undoubtedly after their arrival there. Guérin gives more definite expression to this fact, when he says that among the negroes imported into the West Indies from the Congo there have certainly been a few cases of lethargy, that some of these have occurred even a considerable time after arrival, but that there has been none of it in those who have lived in Martinique ten or twenty years, nor among Creole negroes. We learn also from Nicolas that in every ten cases known to him nine were in men and one in a woman. But Corre and Guérin, who could draw upon much larger experience, are agreed that the number of cases is much the same in either sex. It spares no *time of life*, as Corre has found, but it oftenest attacks negroes from twelve to eighteen years of age, and rarely anyone younger.

§ 190. SUMMARY OF THE ETIOLOGY.

It is obvious that the origin of the malady has nothing to do with influences of climate and soil. There is some foundation for the surmise that its cause will be found to lie in certain agencies bound up with the *manner of life* of the natives in those regions; but no one has succeeded hitherto in reaching anything definite concerning them; and all the hypotheses that have been tried have proved to be untenable.

The opinion often expressed that negro lethargy is a toxic process, has to be set aside on several grounds. The smoking of "dianba" (Indian hemp) has been blamed for it (Clarke); but that practice obtains all over the East without giving rise to the disease anywhere. Another suspected habit is the inordinate addiction to palm wine, a practice that is indigenous to many other tropical countries where the malady is unknown; moreover, as Corre tells us, the orthodox Marabouts, who drink nothing but water, are as much subject to lethargy as the veriest toppers. It is equally impossible to find a basis for the widely received doctrine that the disease is due to criminal poisoning. That view found a supporter recently in Corre,¹ in the first of his papers on the subject, although he would appear to have abandoned it subsequently; among other reasons against it, is the occurrence of the malady among negroes away from Africa, as in the West Indies.

Another very widely entertained theory of the origin of the disease is that it is a consequence of *depressing emotions*, particularly those *associated with the slave trade* (nostalgia, sorrow from the breaking up of families, or the feelings arising out of bad treatment at the hands of slave-dealers and slave-owners). But for recent times that cause can hardly come into the question to any considerable extent; and the hypothesis would leave it quite inexplicable why the disease should have been so rare in former times, if it occurred at all, whilst slavery was at its height in the New World, and all those affections of the mind most keenly felt. The chief objection to the hypotheiss, however, is that the disease occurs also in Liberia, among negroes living in freedom in their native seats and amidst orderly, if not particularly good conditions; and that in Martinique, as Guérin informs us, it is oftenest seen in those employed as domestic servants in the towns, and leading a comfortable and perfectly contented life.

The last theory that we have to mention arises out of the

¹ In his paper in the 'Gaz. méd. de Paris' (l. c.), he throws out the conjecture
 "poisoning by certain moulds growing on maize, rice
 "use of which as food would set up a disease like
 'Arch. de méd. nav.' l. c.), nothing further is

fact referred to above, that in many of those attacked by lethargy, there have been observed *glandular swellings in the neck*, which may precede the disease. According to a very general belief among the natives, these are the cause of it; and accordingly, whenever they show themselves in a child, they are cut out by the medicine-man. McCarthy¹ and Gore, who were the first to call attention to these glandular swellings, have suggested that an enlargement of the deep cervical glands would cause pressure upon the vessels going to the brain, and thus have the effect of diminishing the supply of blood to that organ; on that hypothesis they would explain the whole series of phenomena. This explanation is altogether untenable and hardly requires to be seriously met. Equally fanciful is the hypothesis worked out from the same fact by Corre, who himself admits that glandular enlargements are by no means constant in negroes suffering from lethargy, and that they are often exceedingly slight (which shows that there can be no thought of their pressing on the blood-vessels). He dwells upon the exceedingly common occurrence of scrofula among the natives of those parts of the West Coast, therein finding the explanation of the frequency of glandular swellings in the neck; and his hypothesis is that the lethargy is due to a scrofulous affection of the brain, or to cerebral tubercle so-called, the morbid phenomena (tremors, ataxia, &c.) of lethargy resembling, in his opinion, the symptoms of cerebral sclerosis: "La maladie du sommeil," he says, "est une maladie de misère, une proche voisine de la scrofule, si non sa parente, ce qui reste à établir par les autopsies rigoureuses et de nouvelles observations." But it seems to me that we can hardly with a good conscience subscribe to more than the last clause of that sentence.

¹ Quoted in the paper by Ogle.

CHAPTER XX.

TETANUS.

§ 191. A DISEASE OF ALL TIMES AND COUNTRIES.

That the medical practitioners of antiquity had an accurate knowledge of tetanus appears from the medical writings of the period, such as the Hippocratic Collection,¹ and the works of Aretaeus² (who gives an excellent description of the disease), of Galen³, of Soranus (or Caelius Aurelianus),⁴ and of Paulus.⁵ There is the same evidence in the compendiums of the Arabian and other mediæval practitioners. We are therefore warranted in assuming that the malady had been known in the practice of early ages very much as it is known now, and that it has been at all times general. The absence of statistics such as we can use, and that too not merely for past centuries but just as palpably for the present time, makes nugatory every attempt to estimate in figures the amount of tetanus at various periods of history and in various parts of the world. What we know of the genesis of the disease renders it probable that there had been hardly any real differences in its frequency between one century and another.

On the other hand, the geographical information about tetanus, both from former centuries and the present, leaves no doubt that there are very considerable differences between the several countries of the globe in respect to the frequency

¹ 'De diaeta in acutis,' App. § 14 ed., Littré, ii, 468; 'De fracturis,' § 31 e. c. iii, 530; Aphor. v, § 17, 20 e. c. iv, 538; 'Epidem.,' v, § 15 e. c. v, 214; 'De morbis,' iii, § 12 e. c. vii, 132; 'De affect. intern.,' § 52—54 e. c. vii, 298.

² 'Morb. acut.,' i, cap. vi.

³ 'Lib. de tremore, palpitatione, convulsione et rigore,' ed. Kühn, vii, 585.

⁴ 'Acut. morb.,' iii, cap. vi, ed. Almeloveen, 204.

⁵ 'Lib. iii, cap. 20, ed. Basil, 1551, 164.

of the malady, although our only measure of these is in such general expressions as "rare," "frequent," or "very common." The differences are represented broadly by the comparative rarity of tetanus in the higher latitudes, its increasing frequency as we approach the lower, and its almost endemic character at some few spots.

§ 192. GEOGRAPHICAL DISTRIBUTION.

In the *cold and temperate zones* of both hemispheres, tetanus does not occur often, unless under special conditions to be afterwards mentioned. It is a doubtful point, and one that can hardly be settled by the statistics of mortality, whether there is more of the disease in the southern countries of Europe and in the Central United States of America, than in the first mentioned group. It begins to be a good deal more common in subtropical regions, such as the *Southern States* of the American Union, the *States of the River Plate*, *Algiers* (especially Oran and Constantine¹), the *Cape*,² *Egypt* and *Syria* (the coast mostly).³ "Tetanus is very common in our Southern States," says an American writer⁴; but, as regards Philadelphia he adds: "it is of such rare occurrence in this city, that we have seen in twenty-four years' practice only three cases of it." Its commonness in the South is confirmed by Chalmers⁵ for S. Carolina, and for Savannah by Sheftall,⁶ who says: "Tetanus is one of the most formidable diseases which we have to deal with." Its unusual frequency in the Argentine Republic is affirmed unanimously by Brunel,⁷ Mantegazza,⁸ Dupont,⁹ Férís¹⁰ and by Pellissier,¹¹

¹ Guyon, 'Gaz. méd. de Paris,' 1839, Nr. 46.

² Schwarz, 'Ztschr. der Wiener Aerzte,' 1858, 630.

³ Pruner, 'Krankh. des Orients,' 302; Vauvray, 'Arch. de méd. nav.,' 1873, Sept., 179 (for Port Said).

⁴ In a review of Reid, "On the Nature and Treatment of Tetanus," in 'Amer. Journ. of Med. Sc.,' 1829, Feb., 378.

⁵ 'Med. Observ. and Inquir.,' Lond., 1757, i, 87, and 'Account of the Weather and Diseases of South Carolina,' Lond., 1776. Germ. ed., Stend., 1796, ii, 25.

⁶ 'Amer. Med. and Philos. Register,' ii, 145.

⁷ 'Observ. topogr. . . faites dans le Rio-de-la-Plata,' Par., 1842, 44.

⁸ 'Lettere med. sulla America meridionale,' Milano, 1860, i, 10.

⁹ 'Notes et observ. sur la côte orient. d'Amérique,' Montp., 1868, 17.

¹⁰ 'Arch. de méd. nav.,' 1879, Oct., 254.

¹¹ 'Considérat. sur le tétaunos traumatique,' Par., 1868.

who saw many cases of it in the war between the Republic and Brazil.

But the largest amount of tetanus falls to countries of both Hemispheres within the tropics. In the Western Hemisphere special mention has to be made of Vera Cruz and other points on the *Mexican Coast*¹ of *Central America*,² the *West Indies* (truly endemic, as we shall see, at many places), *Guiana*,³ *Brazil*, *Peru*⁴ and *Guayaquil (Ecuador)*.⁵ Among the Antilles, *Cuba*⁶ is mentioned as specially subject to tetanus; Biart states that his brother, in the course of fourteen years' practice, saw 417 cases; and, according to Dupont, the medical officers of the Clinique had under treatment 858 cases in two years. Also in *St. Domingo*,⁷ tetanus, according to Llenas, is among the most terrible of scourges; and in *Jamaica*, where Lemprière⁸ tells us that it is truly endemic, while according to Bisset's⁹ experience, it is much more common in some parts of the island than in others. It is frequent also in *Porto Rico*,¹⁰ and, of the Lesser Antilles, in *St. Bartholomew*,¹¹ *Guadeloupe*,¹² *Martinique*¹³ and

¹ Bouffier, *ib.*, 1865, Mai, 535.

² Bernhard, 'Deutsche Klin.', 1854, Nr. 11 (from observations in Nicaragua); McDowall, 'Lancet,' 1861, Sept., 240 (experiences of the Secession War).

³ See the following: Bajon ('Nachrichten zur Geschichte . . . von Cayenne,' From the French. Erfurt, 1780, ii, 91, and 'Journ. de méd.,' xxx, 406); Campet ('Traité prat. des malad. graves des pays chauds,' Par., 1802, 1); Segond ('Journ. hebdom. des progrès des sc. méd.,' 1835, Nr. 12); Dupont (l. c.) and Sanguier ('Quelques mots sur le tetanos,' Par., 1869) for Cayenne; Rodschied ('Bemerk. über das Klima von Rio Essequibo,' Frft., 1796, 284); Morrison ('Treatise on Tetanus, &c.,' Newry, 1816) and Blair ('Account of the Last Yellow Fever Epidemic, &c.,' Lond., 1850, 21) for British Guiana; Hille (in Casper's 'Wochenschr. für die ges. Hlkd.,' 1845, 1), and v. Leent ('Arch. de méd. nav.,' 1880, Nov., 403) for Surinam.

⁴ Tschudi, 'Oest. med. Wochenschr.,' 1846, 469; Smith, 'Edinb. Med. and Surg. Journ.,' 1841, Oct., 395. ⁵ Ref. in 'Arch. de méd. nav.,' 1864, Oct., 284.

⁶ See Briart de Beauregard, 'Du tétanos traumatique, &c.,' Par., 1857; Dupont, l. c.

⁷ Desportes, 'Hist. des malad. de St. Domingue,' Par., 1770, ii, 157; Smith, 'Amer. Journ. of Med. Sc.,' 1835, Nov., 66; Llenas, 'Contrib. à l'histoire des malad. de St. Domingue,' Par., 1874, 25.

⁸ 'On the Diseases of the Army in Jamaica,' i, 47.

⁹ 'Medical Essays and Observations,' Newcastle, 1776. German ed., Bresl., 1781, 81.

¹⁰ Cordoba, 'Memor. geogr. . . de la Isla de Puerto-Rico,' Sanmiltan, 1831.

¹¹ Forström, 'Svenska Läk. Sällsk. Hdl.,' iv, 236.

¹² Lefoulon, 'Journ. gén. de méd.,' iii, 257.

¹³ Savarésy, 'De la fièvre jaune,' Naples, 1809, 17.

Barbadoes.¹ On the other hand it is not common on St. Lucia, according to Levacher;² and, according to Anderson,³ less common in Trinidad than in other islands, and rarer in Port of Spain than in the open country. In the accounts from *Brazil*,⁴ mention is made of tetanus being especially common on the Atlantic Coast, and in the tropical provinces of Para, Pernambuco, Bahia, Rio de Janeiro and San Paulo.

Among the tropical countries of the Eastern Hemisphere the chief seats of tetanus are *Senegambia*⁵ (the region of the Gambia in particular), certain points on the *Guinea Coast*⁶ (especially the Gold Coast), *St. Helena*,⁷ *Madagascar*,⁸ *Réunion*,⁹ *Mauritius*,¹⁰ and *Nubia*;¹¹ also the islands of *Polynesia*,¹² particularly *New Caledonia*;¹³ and, on Asiatic soil, *Arabia*,¹⁴ *India* and *Ceylon*.¹⁵ Heymann¹⁶ agrees with v. d. Burg¹⁷ in saying that tetanus is not to be reckoned a common disease of the East Indies; and in like manner Beaufile¹⁸ has not seen it in Cochin China except to a moderate extent.

¹ Hillary, 'Obs. . . on the Epidemical Diseases in Barbadoes,' Lond., 1766. Germ. ed., Lpz., 1776, 259; Jackson, 'Boston Med. and Surg. Journ.,' 1867, July, 4.

² 'Guide méd. des Antilles,' Par., 1840, 133.

³ 'Transact. of the Med.-Chir. Society of Edinb.,' ii, 365.

⁴ Weddel in Castelnau, 'Expedition, &c.,' Jobim, 'Disc. sobre as molestias. . . de Rio de Janeiro,' Rio, 1835; Döllinger in Casper's 'Wochenschr. für die ges. Hlkd.,' 1835, 211; Lallemand, ib., 1848, 91; Pleasants, 'Amer. Journ. of Med. Sc.,' 1842, July; Sigaud, 'Du climat et des maladies du Brésil,' Par., 1844, 121, 138; Betoli, 'Annal. univ. di medicina,' 1859, Jan., 96; Dupont, l. c.; Béringer, 'Arch. de méd. nav.,' 1879, Mars, 221.

⁵ Thévenot, 'Traité des maladies des Européens . . . au Sénégal, &c.,' Paris, 253; Boriis, 'Arch. de méd. nav.,' 1882, Mai, 370.

⁶ Boyle, 'Med.-histor. Account of the Western Coast of Africa, &c.,' Lond., 1831, 405; Clarke, 'Transact. of the Epidemiol. Soc.,' Lond., 1862, i, 114.

⁷ McRitchie, 'Transact. of the Med. Soc. of Calcutta,' viii, App. xxix.

⁸ Guiol, 'Arch. de méd. nav.,' 1882, Nov., 338 (refers particularly to Nossi-Bé).

⁹ Couzier, 'Journ. de méd.,' vii, 401.

¹⁰ Lesson, 'Voyage méd. autour du monde,' Par., 1829, 143.

¹¹ Hartmann, l. c.

¹² Clavel, 'Arch. de méd. nav.,' 1884, Août, 155.

¹³ Charlopin, 'Notes med. rec. en Calédonie, &c.,' Montp., 1868, 23.

¹⁴ Palgrave, l. c.

¹⁵ Christie, 'Edinb. Med. and Surg. Journ.,' 1812, Oct., 411; Marshall, 'Notes on the Med. Topogr. of the Interior of Ceylon,' Lond., 1822.

¹⁶ L. c., 173.

¹⁷ 'De Gencesbeer in Nederl-Indie,' Batav., 1882, i, 78.

¹⁸ 'Arch. de méd. nav.,' 1882, April, 259.

Of the number of cases in various parts of *India* we have several statistical returns, which certainly lay no claim to a high degree of trustworthiness and cannot be used for comparison one with another. However, they afford evidence of the great frequency of the disease in that country; and at the same time they bring out the fact that, as in the West Indies and elsewhere, there are great differences in the amount of tetanus in the various localities. So far as these data enable us to come to a conclusion, the city of Bombay suffers most from the disease. According to the statements of Morehead¹ and Waring,² 1955 persons died of tetanus there from 1848 to 1853, not including the cases of tetanus puerperarum to be afterwards mentioned. That gives a proportion of $2\frac{1}{2}$ per cent. of the deaths from all causes, and the ratio has been tolerably steady from year to year. During the same period, according to Teet,³ 289 cases of tetanus were admitted into the Jamsetjee-Jejeebhoy Hospital alone (an institution for natives). In Madras the disease would appear to be less common, although there is still a good deal of it. King⁴ gives the following figures from the rather incomplete records of one of the hospitals of the city, which is mostly resorted to by the population of two quarters, numbering about 125,000. From 1853 to 1868 there were 225 patients treated for tetanus by the hospital staff (59 in the wards and 166 as out-patients); if we leave out the period from 1848 to 1858, for which the records are extremely defective, we get for the other nine years (1859-67) 141 patients with tetanus, or 15.7 cases in the year, which gives a ratio of 0.13 per 1000 inhabitants. In Calcutta it would appear to be a good deal less common; in the General Hospital of that city,⁵ from 1847 to 1851, there were only 56 cases; in the Medical College Hospital during the ten years from 1869 to 1879, there were 280 cases of tetanus admitted, besides 23 cases of traumatic tetanus which developed in the hospital.⁶ The comparative rarity

¹ *Researches on Disease in India*,^{*} Lond., 1856, ii, 621.

² *Trans. of Med. Sc.*,^{*} 1856, April, 501.

³ *Bombay Med. Soc.*,^{*} 1853, new ser. i, 1.

⁴ *Med. Sc.*,^{*} 1868, Oct., 295.

⁵ *Med. Sc.*,^{*} 1853, July, 58.

⁶ 18.

of the disease in Bengal is shown by the fact that only 8 cases were seen during eight years (1846-54) in a force of 156,139 European troops.¹ Other parts of India where tetanus is reported as rare are the following: the Mahabuleswar Hills (in the Western Ghâts, 17° 59' N.), where Morehead did not see a single case during ten years' service as army surgeon; Cochin Coast (Day²); and Bellary, in the Ceded Districts, where Eyre had only 5 cases of tetanus among 8122 native patients at the Civil Dispensary.³ On the other hand, Smith⁴ calls attention to the prevalence of the malady in Hyderabad on the Deccan plateau.

§ 193. INFLUENCE OF SEASON AND CLIMATE; CHILL AS A CAUSE.

It is usual to distinguish between traumatic and idiopathic tetanus, that is to say, between tetanic spasms following an injury and those that arise where there is no injury; as well as between these and trismus or tetanus neonatorum, a disease that may be disregarded in the present connexion for reasons to be given in the sequel. However justifiable the distinction between the traumatic form and the non-traumatic form may be, it is hardly possible to observe a separation of that sort from the point of view of the etiology in general; for we learn from the geographical inquiry that there is complete identity between the two forms in respect to their distribution over the globe, their frequency at the various places, and their dependence upon definite external influences: or, in other words, that they are closely allied in respect to their origin. There is no question that the affection of the central nervous system, which is conspicuous among the phenomena of tetanus, may be produced by a variety of external causes, and probably by internal causes also; and that among these wounds play a prominent part. But none of the external agencies has a more decided significance in the etiology, none comes more to the front as a real

¹ Macpherson, 'Ind. Annals of Med. Sc.,' 1858, Jan., 236.

² 'Madras Quart. Journ. of Med. Sc.,' 1862, Jan., 34.

³ *Ib.*, 1860, Oct., 332.

⁴ *Ib.*, 1861, Jan., 86.

decisive factor in the pathogenesis, than certain *atmospheric influences*, which determine the distribution of tetanus over the globe no less than its predominance at certain seasons and under certain kinds of weather.

All observers who have had practical experience of tetanus in various latitudes are agreed in saying that the disease is commonest in the tropics, and that, as a general rule, it becomes less frequent the farther the *climatic circumstances* of the locality diverge from tropical climate. Those experiences of individuals are entirely in agreement with the sketch of the distribution as given above, which shows a decreasing frequency from the equator to the poles. That the height of the *temperature* is not the essential thing here, is shown by the fact that the largest number of cases in the tropics, according to nearly all the authorities, does not fall in the hot season but in the season preceding the rains, and corresponding to our spring, or in the cool season following the rains. That opinion is confirmed to some extent by the statistics of the number of cases in India in the various months. In Bombay the largest number of attacks was in March and in December; in Madras it was in April-May or October-December; in Calcutta, of 280 cases treated in the Medical College Hospital from 1869 to 1879 (according to Wallace¹), 96 were in the cold season from November to February, 71 in the hot season of March and April, and 113 in the rainy season from May to October, the maximum month being December and the minimum July.

I have drawn up the following table of the frequency of tetanus in the several months or seasons in the temperate zone from a large number (759) of single observations, mostly contained in papers by English, German and French practitioners or in hospital reports :

Cases of Tetanus according to Months and Seasons.

December.....	44	March	60
January	50	April.....	68
February	61	May	79
Winter	155	Spring	207

¹ 'Lancet,' 1884, Aug., p. 218.

June.....	62	September.....	74
July.....	65	October.....	63
August.....	77	November.....	56
Summer.....	204	Autumn.....	193

Not counting the winter season, in which the number of cases is absolutely a small one, the proportions for the other three seasons are somewhat equal; but it is worthy of remark that the months of April and May (with 147 cases) and the months of August and September (with 151 cases) being the worst months of the whole twelve, are characterised by an extreme range of temperature or by the same kind of weather that distinguishes the principal season of tetanus in the tropics. The figures correspond, indeed, to a rule of experience which is hardly contested by anyone and is accepted by all the most observant physicians and surgeons, namely, that *extreme vicissitudes of weather*, especially in association with *moisture*, which give rise to sudden chills and set up catarrhs, hold the first place among all the factors that combine to produce tetanus, whether it be the traumatic or the idiopathic form of it. That is also the explanation that I would give of the predominance of the disease in tropical and subtropical countries; for in these the weather-influences are so keenly felt by the residents owing to the sensibility of the skin, that even a slight fall of temperature becomes unpleasant.

Chill was given as a frequent cause of tetanus by the ancient and mediæval physicians, such as Hippocrates, Aretæus and Avicenna; and although opinions have fluctuated a great deal as to the nature and genesis of the disease, that experience has been substantiated to the fullest extent by observers in all subsequent periods, including those of the present time. "La principale cause du tétanus," says Savarésy, in reference to his Martinique experience, "est le passage brusque du chaud à la température fraîche et humide;" and the same view is taken by Forström for St. Bartholomew, by Dickinson¹ for Grenada, by Briart de Beauregard and Dupont for Cuba, and by many other West Indian authorities. Writing on the occurrence of tetanus at

¹ 'Medical Repository,' 1814, March, p. 190.

Leon in Nicaragua, McDowall says: "There is a popular conviction throughout all these parts of Central America, that this spasmodic disease is always brought on by exposure of the (wounded) patient to currents of cold air or sudden and unexpected application of cold water, such as being overtaken by a shower of rain." In Guiana the cold winds which set in suddenly from the north cause a great fall of the temperature, and are very much dreaded on account of their effects in producing tetanus (Dupont). "Ces vents," says Segond, "venus sans interruption des régions les plus froides jusqu'à l'équateur, crispent la peau plus fortement que le mistral du midi de la France et agacent d'autant plus cette membrane que les houppes nerveuses y sont plus humectées par une abondante transpiration. Il faut reconnaître que si l'homme de ces pays l'emporte en sensibilité sur celui d'Europe, c'est que, plus que ce dernier, il a le système nerveux de la peau plus impressionable, plus développé peut-être." "In Brazil," we read in a paper by Pleasants, "cases of idiopathic tetanus show themselves when cold and wet weather sets in after a considerable tract of heat and drought; tetanic spasms are then apt to follow wounds of all sorts, so much so that surgeons hesitate even to let blood during the prevalence of that kind of weather." Jobim, Betoli, and other practitioners in Brazil hold the same language, as well as Tschudi for Peru. "Exposure to draughts of cold air at night" is the real cause assigned by Smith for the epidemic of traumatic and idiopathic tetanus at Hyderabad in July and August, 1859; and in Réunion it was observed by Couzier that tetanus followed a wound, "si le blessé s'expose à l'air froide de montagne." In subtropical countries the same observations have been made: in the Southern States of the American Union (Chalmers), in the States of the River Plate (Brunel), and elsewhere.

But in those regions as well as in the temperate zone, the circumstance has been noted on a larger scale by military surgeons in war. "Le passage plus ou moins subit du chaud au froid," says Guyon with reference to Algiers; and in his experience of the campaign of 1807, he observed that "sans doute, l'une des causes les plus énergiques" of tetanus was the change from warm to cold. Traumatic and

idiopathic tetanus occurred among the troops who were exposed to severe vicissitudes of the weather on the march back to Constantine. Larrey's experiences of tetanus during the Egyptian campaign of 1799—1801 are well known;¹ in those instances also, tetanus showed itself immediately after the temperature began to be unsteady, and particularly when the wounded were exposed to the chill and damp air of night, or the men were encamped on damp ground under the open sky. The same thing was observed by Hennen² among the British troops in Syria during the same campaign. According to Demme's³ statement, nothing had so obvious an influence on the production of tetanus among the troops in the Austro-Italian war of 1849, as the setting in of cold and wet weather after heat and drought, together with chilling and damp quarters, and most of all the exposure of the heated body to cold draughts. Larrey's observations in Egypt were repeated⁴ by him in Austria (in the spring of 1809), and by Ruppis⁵ among the wounded in the hospitals of Altenburg after the battle of Lützen. Thierry⁶ relates that, on the day after the battle of Bantzen (May 20th, 1813), the wounded having been left over night in the open air on damp ground in cold and wet weather, 110 cases of tetanus were reported.

Another noteworthy fact is that, in many parts of the world where tetanus is particularly apt to occur, even animals, such as the horse and ox, are not unfrequently attacked and killed by idiopathic and traumatic tetanus under the same harmful influences. Pleasants mentions the occurrence of the disease among sheep in Brazil in these circumstances; Savarésy has seen horses attacked by idiopathic tetanic spasms in Martinique, when they were exposed to cold currents of air after being heated by a smart run; and Bajon has observed the same thing in Cayenne. Stillwell (of Long Island) and Betoli (of Brazil) state that they have known the disease to ensue in animals under the same circumstances,

¹ 'Mémoires de Chirurgie Militaire.' German ed., Leipzig, 1813, i, 72.

² 'Principles of Military Surgery,' Edin., 1820.

³ 'Allg. Chirurgie der Kriegswunden, u. s. w.,' Würzb., 1861.

⁴ L. c., i, 508.

⁵ In Rust's 'Magazin für die ges. Hlkde.,' 1821, xi, 17.

⁶ 'Bullet. des sc. méd.,' 1829, xvii, 201.

but more especially after castration, and in horses after being shod.

It is easy to understand how the disease may sometimes assume an epidemic character when these weather-influences last for a considerable period ; some Indian experiences show this, the experience of warfare more particularly.

§ 194. LOCALITY UNIMPORTANT EXCEPT AS INFLUENCING
WEATHER.

There is no reason to think that the state of the soil, in itself, or, as often asserted, a marshy and malarious soil, has any influence on the production of tetanus. That this view is absolutely untenable seems to me to be proved most decisively by the fact that those regions of India, such as Bengal, which contain the largest and most intense centres of malaria, are much less subject to tetanus than the Bombay Presidency, which is not nearly so bad as Bengal in respect to malarial fevers. On the other hand, *configuration, elevation*, and other circumstances of *locality* have a decided significance, in so far as they give protection to a district or place against the effects of unfavorable weather (cold and damp winds, and the like), or as the locality wants protection of that sort and therefore favours the endemic prevalence of the malady under certain circumstances.

Thus, Bajon says of Cayenne: "We find that this disease is more common among those inhabitants of the coast who live on elevations or hills directly exposed to the sea breeze than among those whose dwellings are in swampy localities and therefore protected from that wind by mountains or extensive forests." Referring to Algiers, Guyon says: "La proportion des tétaniques qui se sont présentés en Algérie a été plus forte à Oran que sur les autres points, ce qui paraît devoir s'expliquer par la position de cette ville exposée, par son élévation, comme aussi par certaines dispositions locales, à une ventilation plus grande que celle à laquelle sont soumises nos autres villes de l'Algérie, à part peut-être Constantine."

§ 195. ALLEGED INFECTIVE NATURE.

The doctrine that the central nervous affection which underlies tetanus may be excited, in certain circumstances, by a morbid condition of the blood, giving the disease an *infective character*, finds support in facts that will be mentioned when we come to speak of trismus neonatorum. But the theory developed by Heiberg,¹ to the effect that "tetanus is not a nervous disease, but a morbid process localised in the muscles and depending on a blood-disorder or on blood-poisoning," must be rejected as having at present absolutely no foundation; and the fact brought forward to support it, that there is a form of tetanus due to strychnine-poisoning, will not be considered to be a well-advised line of argument.

§ 196. MOST COMMON IN THE NEGRO RACE.

There is one other notable fact in the natural history of tetanus, namely, the influence of *race* on the frequency of the malady, or in other words, its commonness among the coloured races, negroes in particular, and its comparative rarity among white men. The fact holds good not only for those parts of the world where the dark-skinned races, especially negroes, have been introduced, such as the West Indies,² Guiana,³ Brazil,⁴ the River Plate States,⁵ Peru⁶ and the Southern States of the American Union;⁷ but also for their native seats, as is shown by the prevalence of tetanus among negroes in Senegambia⁸ and other parts of the West Coast of Africa,⁹ among the native coloured population of Cape Colony (Caffirs¹⁰ in particular), among the coloured races of India¹¹ and the East Indies,¹² among the Indians of Brazil,¹³ and the native population of the West Indies.¹⁴ It

¹ 'Norsk Magazin for Laegevidensk,' 1861, xv, 481.

² See the writings of Lemprière, Forström, Dickinson, Desportes, Mosley, Morrison, and Briart de Beauregard.

³ Dazille, Blair, van Leent.

⁴ Jobim, Weddel, Sigaud, Béringer.

⁵ Brunel.

⁶ Tschudi, Smith.

⁷ Chalmers.

⁸ Thevenot, Borius.

⁹ Clarke.

¹⁰ Schwarz.

¹¹ Morehead, Smith.

¹² Account in 'Arch. de méd. nav.'

¹³ Sigaud.

¹⁴ Smith.

is hardly probable that this is a matter of special vulnerability of the nervous system, or of congenital liability to convulsions in the coloured races; it is more reasonable to look for the cause in some heightened sensibility of the skin, namely, a predisposition to be injuriously acted on by chilling influences. The latter view is all the more probable that even the creoles and acclimatised residents in Cayenne, in Segond's experience, are much more subject to the disease than the new arrivals from Europe, who would not have begun to develop that sensitiveness of the skin under the influence of a tropical climate. But another reason for the greater amount of tetanus among negroes will be found to be that they are much more exposed to the causes of the disease. That applies not only to influences of the weather, which their position in the social scale gives them but little protection from, while they are also notoriously reckless in going about imperfectly clad, or in sleeping out of doors on wet ground; but it holds good also in respect to their being more frequently wounded, especially on the soles of the feet, a circumstance that a large number of observers have rightly laid stress upon. Wounds of that sort are in part incidental to the custom of going about with bare feet (Desportes, Dickinson); but in part the wounds are inflicted by themselves in removing sand-fleas (chigoes) from the skin, a practice bearing on the occurrence of tetanus, which the earlier observers were aware of, and to which Briart de Beauregard has recently directed attention.

Trismus neonatorum.

§ 197. GEOGRAPHICAL DISTRIBUTION.

The kind of tetanic convulsions known as trismus of the newborn is related to traumatic tetanus as regards type, on the ground that a traumatic process arising from mismanagement of the umbilical ligature, or from the separation of the cord, is unquestionably a real element in the causation of the

disease. Lockjaw in newborn children, however, exhibits many peculiarities in the mode of its occurrence and production, which make it necessary for us to treat the subject apart.

Like ordinary tetanus, trismus neonatorum is mostly seen in the tropics; but in contrast to the former it has an endemic area which extends far beyond these limits and reaches, indeed, to the highest latitudes. It is prevalent to a most disastrous extent at many parts of the *West Indies*: in Cuba,¹ for example, there were 369 deaths from trismus neonatorum in two years (Dupont); in Jamaica² it is said that 25 per cent. of the negro children die of it every year; it is equally destructive in Porto Rico,³ St. Thomas,⁴ St. Bartholomew,⁵ Martinique,⁶ Antigua,⁷ Barbadoes,⁸ Grenada,⁹ and, according to all observers,¹⁰ in *Guiana*.

"There is perhaps no country," says Bajon, "where children are so difficult to rear as in Cayenne. They have hardly emerged from their mother's womb to the light of day when they fall, in large numbers, into a state of spasm, which by-and-by locks their jaws and makes the whole body as stiff as a bar of iron." According to Campet, the disease carries off more than one-tenth of all the negro children. Of British *Guiana*, Hancock says: "It is so frequent and fatal in the colonies of Essequibo and Demerara, that, at an average estimate, it kills half of the whole number of infants which are born there."

There is the same complaint of the enormous mortality from tetanus among new-born infants in *Brazil*,¹¹ the *Argentine Republic*,¹² the upper basin of the Marañon (*Ecuador*),¹³ and

¹ Moseley, 'Treatise on Tropical Diseases,' Lond., 1787. German ed., Nürnberg, 1790, p. 425; Desportes, l. c., ii, 157; Dupont, l. c.

² Maxwell, 'Observations on Yaws . . . and Traumatic Tetanus,' Edinb., 1839. See also an extract from the 'Jamaica Med. Journ.,' in 'Revue méd.,' 1835, Nov., 255.

³ Cordoba, l. c. ⁴ Barclay, 'Bibl. for Laeger,' 1830, July, 59. ⁵ Forström, l. c.

⁶ Savarésy, l. c., 17; Rufz, 'Arch. de méd. nav.,' 1869, Aug., 140.

⁷ Furlong, 'Edinb. Med. and Surg. Journ.,' 1830, Jan., 57.

⁸ Hillary, l. c., 259.

⁹ Chisholm, 'Essay on the Malignant Pestil. Fever, &c.,' Lond., 1800, i, 38.

¹⁰ Bajon, l. c., ii, 91, 117; Segond, l. c.; Campet, l. c., 55; Rodschied, l. c., 284; Hancock, 'Edinb. Med. and Surg. Journ.,' 1831, April, 343.

¹¹ Sigaud, l. c., 128; Bourel-Roncière, 'Arch. de méd. nav.,' 1872, Juill., 18, 36; Rey, ib., 1877, Janv., 25.

¹² Mantegazza, l. c., i, 10; Dupont, l. c.; references in Virchow-Hirsch, 'Jahresber. über die Leistungen in der Medicin,' 1878, i, 323, 1880, i, 379.

¹³ Galt, 'Amer. Journ. of Med. Sc.,' 1872, Oct., 398.

the *Southern United States*. Bourel-Roncière estimates the mortality from tetanus in Rio Janeiro at one-fourth of all the infants born in the year. In the city of Buenos Ayres, with a population of about 200,000, and an annual increase of about 1000, the deaths from trismus neonatorum in 1875 were 445, in 1876 they were 433, in 1877 they were 431, but in 1878 and 1879 they fell to 192 and 150 respectively, and in the first half of 1880 they were 108. Mantegazza witnessed a frightful mortality from the disease at Monte Video in 1852. Of the disastrous prevalence of the malady in the Southern States of the American Union, we have accounts from Texas,¹ New Orleans (where 249 in a total of 6617 deaths, or 3·7 per cent., were due to tetanus neonatorum²), Mississippi,³ Alabama,⁴ Tennessee,⁵ and South Carolina⁶ (57 deaths at Charleston in 1856 in a total mortality of 1428, or 4 per cent.⁷).

There are corresponding accounts of the great frequency or endemicity of the disease in the tropical regions of the Eastern Hemisphere: as in *Senegambia*,⁸ the western parts of the *Soudan*⁹ (Segu-Sicorro in 13° 32' N., 8° 26' W.), the *Gold Coast*,¹⁰ the *Cape*¹¹ (among Hottentot infants), *Réunion*,¹² various parts of *India* (according to Rogers¹³ "trismus nascentium is a disease of very common occurrence in India," and Huillet¹⁴ makes special mention of its frequency at Pondi-

¹ Massie, 'Treatise on the Eclectic Southern Practice of Medicine,' Philad., 1854; Chinn, 'New Orleans Med. and Surg. Journ.,' 1854, Sept.

² Account in Leudesdorff's 'Nachrichten,' 1877, xi, 25.

³ Grier, 'New Orleans Med. and Surg. Journ.,' 1854, May.

⁴ Sims, 'Amer. Journ. of Med. Sc.,' 1846, April, 363, 1848, July, 59, Oct., 354; Baldwin, *ib.*, 1846, Oct., 353; Wooten, 'New Orleans Med. and Surg. Journ.,' 1846, May.

⁵ Watson, 'Nashville Journ. of Med. and Surg.,' 1851, June.

⁶ Chalmers, I. c.; Bertram, 'Transact. of the College of Physicians of Philadelphia.' German transl., i, 111.

⁷ Ref. in 'Amer. Journ. of Med. Sc.,' 1858, Oct., 477.

⁸ Thevenot, Borius, Chassaniol, *ll. cc.*

⁹ Quintin, 'Extrait d'un voyage dans le Soudan,' Par., 1869, 52.

¹⁰ Clarke, I. c., 114.

¹¹ Scherzer, 'Zeitschr. der Wiener Aerzte,' 1858, 167; Schwarz, *ib.*, 630; Egan, 'Med. Times and Gaz.,' 1872, Oct., 407.

¹² Couzier, 'Journ. de méd.,' vii, 402; Boirau, 'Gaz. méd. de Paris,' 1841, 444.

¹³ 'Madras Quart. Med. Journ.,' 1841, iii, 65.

¹⁴ 'Arch. de méd. nav.,' 1868, Févr. 83.

cherry), at Penang¹ in the peninsula of *Malacca*, in the *Malay Archipelago*,² and in the islands of *Polynesia*³ within the tropics. From the last-named we have more particular information by Mariner⁴ for the Tonga group, and by Vinson⁵ and Charlopin⁶ for New Caledonia; the statement of Wilkes⁷ for the Samoa group that there is "a great mortality among young children, which is probably owing to their exposure to the weather," may perhaps relate to tetanus.

One notable point in the geographical distribution of trismus neonatorum as compared with that of tetanus in adults, is the much greater prevalence of the former in the *higher latitudes, and even in the extreme polar regions* of both hemispheres. That is true particularly of large and populous towns, where most of the deaths from trismus among newborn infants are among the poorer classes and in ill-kept foundling or lying-in hospitals;⁸ of which more in the sequel.

Whatever information we possess of trismus neonatorum being at all common in *Central and Southern Europe* is contained in a few papers, of which a certain part belong to the past and can hardly serve as a measure of the disease in the present. Thus, Andreas⁹ speaks of its endemicity in several parts of *Spain*, and more especially in *Catalonia*; while Cleghorn¹⁰ reports it from *Minorca*. There are also references¹¹ to its comparative frequency in various parts of *Italy*, and at *Trieste*.¹² Madier,¹³ writing at the end of last century,

¹ Ward and Grant, 'Official Papers on the Med. Statist. and Topogr. of Malacca, &c.,' Penang, 1831.

² Account in 'Arch. de méd. nav.,' 1867, Sept., 172.

³ De la Quesnerie, *ib.*, 1882, Sept., 203.

⁴ 'Account of the Tonga Islands,' Lond., 1818, ii, 241.

⁵ 'Topogr. méd. de la Nouvelle-Calédonie,' Par., 1858.

⁶ *L. c.*

⁷ 'U. S. Exploring Expedition, &c.,' Philad., 1845, ii, 124.

⁸ See Smith, 'Amer. Journ. of Med. Sc.,' 1865, Oct., p. 312.

⁹ 'Practica Gotholanorum, &c.,' Barcelona, 1678.

¹⁰ 'Obs. on the Epidem. Diseases in Minorca,' Lond. Germ. ed., Gotha, 1776, 87.

¹¹ Frank, 'Prax. med. univ. praecepta,' ii, vol. i, sect. ii, 507, Ann. 13; Trévisan, 'Revue méd.,' 1829, Mai, 319; Ozanam, 'Histoire des malad. épidémiques,' Lyon, 1835, iv, 244.

¹² Paterni, 'Memoria sopra il trismo de fanciulli recentemente nati,' Genoa, 1785; Reuss, 'Epistola in Frank's 'Interpretationes clin.,' Tübing., 1812, 371.

¹³ 'Hist. de la soc. roy. de med.,' iv, Mém. 133.

says that at Bourg St. Andéol (*Vivarois*) trismus neonatorum, colloquially known as "sarrette," carries off one-tenth of all the infants born in the year. It is very common, according to Wylde,¹ in *Ireland*. In *Fulda*, Schneider² saw so much of it during the first quarter of this century (especially in 1802 and 1810) that he is disposed to speak of it as an endemic disease; and in like manner Weber³ tells us of a village with 1700 inhabitants in the circle of Lebus (department of Frankfurt), where 13 new-born infants died of it in the single autumn of 1836.

At length we come to speak of the frequency or endemicity of tetanus neonatorum at places within the highest latitudes. *Miquelon*, near Newfoundland, is in that category⁴ in the Western Hemisphere; and in the Eastern we find St. Kilda (*Hebrides*)⁵ and *Iceland*,⁶ where the disease, not so very long ago, had a truly endemic character and caused a dreadful mortality among new-born infants, although, strangely enough, the Farøe Islands have always been free from it.⁷ The worst Icelandic centre was the small island of Westmannö off the southern coast, where the disease prevailed to so frightful an extent that, as Schleisner informs us, 64 per cent. of the infants born in a year died of "ginklófi," as it is called; but it has become a good deal less common there since they have taken to treating the new-born children with greater care. We learn also from Finsen that, on the small island of Grimsö, lying some six miles off the north coast of Iceland, two out of three children born there, on an annual average, die of tetanus; and that the malady is relatively

¹ 'Edinb. Med. and Surg. Journ.,' 1845, April, 277.

² 'Ueber den Kinnbackenkrampf neugeborener Kinder,' Herborn, 1805; and 'Annal. der Heilkst.,' 1811, 302, 306.

³ 'Sanitätsbericht für die Provinz Brandenburg f. d. Jahr 1836,' 36.

⁴ Gras, 'Quelques mots sur Miquelon,' Montp., 1867, 34.

⁵ Account in 'Brit. Med. Journ.,' 1877, March, 395.

⁶ Scheel, 'N. nord. Archiv für Arzneiwissenschaft,' i, 106; Holland, 'Edinb. Med. and Surg. Journ.,' 1812, April, 205, and 'Med. Notes and Reflections,' Lond., 1839, 22; Bolbro, 'Bibl. for Laeger,' 1838, i, 296, 1839, i, 145, 1840, i, 117; Schleisner, 'Island, &c.,' 23; Thomson, 'Ueber die Krankheiten auf Island, &c.,' Schleswig, 1855; Hjalmarson in 'Sundhedskoll. Aarsberetning for 1853,' 30; Finsen, ib., 1860, 408, and 'Jagttagelser angaaende Sygdomsforholdene i Island,' Kjöbenhavn, 1874, 128.

⁷ Manicus, 'Bibl. for Laeger,' 1824, i, 15.

common at still other places, although it cannot be said that it is now endemic in Iceland generally.

§ 198. INFLUENCE OF CHILL.

Incomplete as our information is concerning the frequency of tetanus neonatorum at the various parts of the world, we know enough of its enormous prevalence in the tropics and in subtropical countries to put the fact beyond question that *climate* has some influence upon it. There is equally little reason to doubt that something of a traumatic nature is an essential predisposing factor; while the weather-conditions above mentioned take a foremost place among the real causes of the disease. The doctrine that tetanus neonatorum is very often to be interpreted as *traumatic lockjaw*, is borne out by the fact that it mostly appears between the sixth and twelfth day after birth, or during the period when the detachment of the fragment of umbilical cord is proceeding; and the opinion often expressed, that bad treatment of the umbilical cord after the birth is a contributory cause, is not to be summarily dismissed as improbable. Another operation that has often given rise to trismus neonatorum is circumcision of Jewish and Mohammedan infants.

Regarding the influence of *season* and *weather* on the occurrence of trismus neonatorum, the circumstances are very much the same as in the case of tetanus of adults. Most of the cases occur in the seasons of extreme range of temperature or of cold and wet weather, or at those times of the year when *chill-disorders* are commonest.

Sauvages¹ has said: 'Hic morbus (trismus neonat.) hieme et cum aura humida saepius advenit quam sicca aestate.' Schneeman² sums up his experience in the remark that "the disease occurs oftenest in cold and wet weather, or in summer when cold nights follow hot days;" and Weber says the same.

Gras writes as follows of the disease on the island of Miquelon: "Je suis très porté à croire que le froid et surtout le froid humide, est une des causes les plus favorables à son développement. Les enfants qui en ont été les victimes, étaient nés dans la saison humide du printemps."

¹ 'Nosologia method.,' ed. Lips., 1795, iii, 34.

² 'Hannov. Annal. für die ges. Heilkde.' 1840, v, 484.

In Buenos Ayres most of the cases occur in the damp months from April to June (Corre). The authorities for the tropics give the same explanation; thus Desportes for St. Domingo: "Le spasme est plus commun dans les temps pluvieux que dans les temps secs et aussi dans le Septembre et Octobre, où le chaud et le frais se succèdent plus subitement." Under the influence of these kinds of weather, the disease has sometimes assumed an epidemic character, for example in 1834 at the general lying-in hospital of Stockholm, where 42 out of 505 children died of tetanus during the year. Cederschjöld,¹ who records the fact, had made prolonged observations in the hospital on the effects of severe changes of weather (especially from warmth to cold and wet) in producing tetanus neonatorum, and he thinks it highly probable that that meteorological factor, which was quite particularly noticeable in the spring of 1834, had been the real reason for the disease growing into an epidemic.

Other weighty evidence of the effect of chill in the pathogenesis is furnished by the universal experience of practitioners in the tropics in respect to the native children.

"On conçoit l'action du froid dans un pays brûlant pendant le jour, mais où le froid des nuits est d'autant plus saisissant, quand il frappe ces petits êtres qu'aucun vêtement ne protège," says Thevenot with reference to Senegambia, having previously remarked upon the gross neglect to clothe or cover the native children on the part of their extremely careless mothers. In like manner Campet writes from Cayenne: "Les négresses sont en général peu attachées à leurs enfants, surtout les filles . . . les cases des nègres sont ordinairement en mauvais état, dégradées, percées à jour de toute part, et conséquemment de dangereuses habitations, surtout pour des enfants; on y est nuit et jour exposé aux impressions des vents-coulis dont on connaît les effets, ce qui doit déjà être considéré comme une des causes qui concourent à les rendre si sujets à cette maladie."

Completely in agreement herewith are the accounts given by Baldwin and Dowell of the prevalence of the disease among negro infants in the Southern States, by Desportes, Savarésy and others for the West Indies, by Quintin for the Soudan, and by Scherzer concerning the disease among Hottentot infants at the Cape. By way of explaining the rarity of it among the creole children in Martinique, as contrasted with its commonness in negro infants, Savarésy has the following remark:

"La précaution, qu'ont les créoles de ne point exposer à l'air extérieur leurs enfants nouveau-nés pendant quarante à cinquante jours, et

¹ 'Svenska Läkare-Sällskapets nya Handl.,' ii, 1838, p. 52.

quelque fois plus, si l'enfant est indisposé, ou lorsque la saison est mauvaise, est une mesure très-salutaire, et peut-être le seul moyen pour les garantir du mal de machoire ou du trismus neonatorum."

§ 199. ALMOST PECULIAR TO INFANTS OF THE FILTHY POOR.

There is, however, another point to be considered here, to which I have already referred and on which I should be inclined to lay special stress for the production of trismus neonatorum. I mean *bad hygiene*, which would set up *infection* in the new-born infant all the more readily that the umbilical surface offers an easy way of entrance to infective matters. Among the authorities on lockjaw in the new-born, there is but one opinion that the disease is almost confined to the crowded and filthy dwellings of the poor, or to badly kept foundling and lying-in hospitals, breaking out in the latter whenever the insanitary state arises as a result of overcrowding or of an epidemic of puerperal fever, or the like. All practitioners who have seen the disease in the tropics are agreed that, next to chill, one of the most potent causes of trismus neonatorum is the neglected and filthy state of negro dwellings, which baffles all description, and reaches its height at the time of a confinement. A number of observers in temperate climates have held the same language regarding the effect of filth in the production of trismus.

"Trismus," says Schneemann, "is almost confined to poor families living in small rooms, or to those who take no great trouble about keeping the air pure, and who dry their linen in the house, or where the children lie in the same bed with the mother." Smith, whose observations relate to New York, says: "The ten cases occurring in my own practice were all met with in tenement-houses or shanties, where habits of cleanliness are impossible, and I have not yet seen or heard of a case in the better class of domiciles;" and he adds: "The statements of physicians in the Southern States, who speak from extensive observation among the negroes, are strongly corroborative of the idea that the disease is in great measure due to the cause which we are considering." We find a confirmation of this in Watson's account of the endemic prevalence of the disease among the negroes of Tennessee: "When called to see their children we find their clothes wet around their hips, and often up to their armpits, with urine . . . The child is thus

presented to us, when, on examination, we find the umbilical dressing not only wet with urine, but soiled likewise with fæces, freely giving off an offensive urinous and fæcal odour combined at times with a gangrenous fetor, arising from the decomposition, not desiccation of the cord."

The circumstances are described as being the same in Texas by Dowell, and in Brazil by Dupont; and, that they really stand in some direct causal relation to the disease, is shown by the fact that their improvement is, in this as in other cases, the best means of preventing the disease.

"When the disease appears endemically on a plantation," says Grier, "it may be arrested by having the negro-houses whitewashed with lime inside and out, by raising the floor above the ground, by removing all filth from under and about the houses, by paying particular attention to cleanliness in the bedding and clothes of the mother and in dressing of the child."

A very interesting confirmation of this fact is furnished by Clarke's experiences of the Dublin Rotunda from 1757 to 1789, as well as by Schleisner's experience in Iceland. In the Rotunda from 1757 to 1782 there were 17,650 births; and of those infants, 2944, or more than 16 per cent., died, most of them from trismus. Clarke saw that insanitary conditions were the real cause of this frightful mortality; and the reforms that he introduced in the ventilation of the lying-in rooms and in keeping the infants clean, had the effect of bringing down the death-rate so considerably that, in the next eight years (1782-90) not more than 419 out of 8033 infants, or 5 per cent., died. Without seeking to throw doubt upon the part played, according to Cederschjöld, by the bad weather in the 1834 epidemic of trismus at the general lying-in hospital of Stockholm, I hold it to be an open question whether defects of hygiene did not contribute to that epidemic; the more so that Cederschjöld himself does not fail to express his surprise that the disease, so far as he knew, was seen nowhere in Stockholm outside the institution, and also because there was no case of it in the other lying-in house "*Pro patria*," as I gather from the report on it for the same year by Retzius.¹ We may also advert here to the prevalence of trismus neonatorum in the lying-in house of

¹ '*Svenska Läkare-Sällskapets nya Handl.*' 1838, ii, 73.

Copenhagen in 1838-39, an outbreak which Levy¹ found reason to associate with the puerperal fever that was epidemic at the same time.

It is of special interest, in judging of this matter, to keep in mind the Icelandic experience of a very considerable decline in the death-rate from trismus of the new-born following upon hygienic reforms. From 1785 to 1846 the average annual mortality of new-born children on the island of Westmannö was 62 per cent.; in the summer of 1847 a lying-in house was erected on the island at Schleisner's instigation, into which women in labour were admitted free of charge; the infants of women confined at their homes were also received immediately after birth, carefully tended, and returned to their mothers when they were two or three weeks old; and since that time things have altered so much for the better that the number of cases of trismus ending fatally had fallen in 1863 to 12 per cent.

§ 200. MOST OF IT IN THE TROPICS IN NEGRO FAMILIES.

It need hardly be said that the causes of tetanus neonatorum here mentioned do not exhaust the whole of the factors in the disease.² But those that have been stated do represent the etiological factors which are at work on a large scale either singly or in combination, and which bring about a general prevalence of the malady at particular places or times. It is in that way, and not from any racial peculiarities, that we must explain its predominance, according to all observers, in tropical countries, among the children of the natives and particularly of the negroes, as contrasted with the infants of

¹ 'Bibl. for Læger,' 1840, N. R., iii, 185.

² Keber ('Monatschrift für Geburtskunde,' 1868, xxxi, 433, and 1869, xxvii, 66) mentions the following interesting fact: At Elbing, in the years 1863-68, a very large number of cases of trismus were seen. They were all in the practice of one of the best-employed midwives in the town; and the explanation of the remarkable phenomenon was at length forthcoming: this woman was the subject of an abnormally feeble sense of temperature in her hands, which had led her to wash the infants in too hot water. Similar instances of a series of cases in the practice of one midwife have occurred at several other places, as in two villages of Hanover ('Hannöv. Zeitschr. für Heilkde.,' 1867, No. 4, p. 293), although nothing has been discovered to account for them.

Europeans or creoles, who are tended so carefully and so well guarded from everything that could harm them, that they are hardly more subject to the disease than infants are on the average in the civilised countries of the temperate zone.

Tetanus puerperarum.

§ 201. COMMON IN SOME HOT COUNTRIES ; EXPERIENCE OF BOMBAY.

The existence of this form in the tropics makes an interesting point in the natural history of traumatic tetanus. In temperate latitudes, as is well known, tetanus is one of the very rarest puerperal accidents;¹ and its frequency in the tropics, doubtless to be explained by the hygienic and atmospheric circumstances above mentioned, is the more remarkable. In most of the papers on the subject, which are not a large number, the reference to the frequency of tetanus among puerperæ is only in general terms ; but in the paper by Waring² we have definite particulars. In the city of Bombay from 1851 to 1853 no fewer than 233 women died of tetanus in childbed, the disease coming on in 7 cases on the first day, in 138 cases between the second and sixth day, in 58 cases between the seventh and tenth day, and in the remainder after a longer interval. This enormous mortality from tetanus among lying-in women is the more remarkable that other puerperal diseases are extremely rare in Bombay ; thus, during the same three years, there were only 21 fatal cases of puerperal fever, 2 of puerperal eclampsia, and 1 of phlegmasia dolens.

¹ See the summary by Simpson, 'Edin. Monthly Journ. of Med. Sc.,' 1854, Feb., p. 97.

² 'Indian Annals of Med. Sc.,' 1856, April, p. 504.

CHAPTER XXI.

SUNSTROKE AND HEATSTROKE

(INSOLATIO, COUP-DE-SOLEIL, CALENTURA, COUP-DE-CHALEUR.)

§ 202. REFERENCES IN OLD WRITINGS; CONFUSED WITH APOPLEXY.

The harmful effects on the health and vitality of men and animals, produced by unusually high temperature, and particularly by the direct action of the sun's rays, have been well known in all ages. In the Hebrew Scriptures we find several references to this matter; and from the later period of antiquity, as well as from the middle ages, we have a few accounts relating to the sickness and death of large numbers of people, more especially in bodies of troops, who had been exposed to that kind of noxious influence.

In 2 Kings, iv, 18—20, it is related of the son of the Shunammite woman: "And when the child was grown, it fell on a day that he went out to his father to the reapers. And he said unto his father, My head, my head! And he said to a lad, Carry him to his mother. And when he had taken him and brought him to his mother, he sat on her knees till noon, and then died." Of the same tenour is the story of the death of Judith's husband in the harvest field. (Judith viii, 2, 3.)

In Psalms cxxi, 5, 6, it is said: "The Lord is thy shade upon thy right hand. The sun shall not smite thee by day. . . ."

The campaign undertaken in 24 B.C. by Aelius Gallus the Pro-Consul of Egypt, for the subjugation of Arabia Felix, came to a disastrous end owing to the loss of so many of the Roman soldiers from the effects of the scorching Arabian sun; in the account given of the circumstances by Dio Cassius ('Histor. Roman.,' liii, cap. 29) it is narrated at length how those who were struck down came to a sudden end with serious symptoms in the head or brain. The following is a reference to Aix-la-Chapelle in July of the very hot and dry year of 1022, when the Synod

met in that city:¹ "Tanta siccitas aëris et intemperies aestatis excanduit, ut multi mortalium prae nimio ardore deficere putarentur, sed et aliquot animalia subito laberentur extincta."

In the summer of 1097 the Crusaders on the march through Bithynia and Phrygia suffered so much from the heat and the scarcity of water that hundreds of them died every day.² It is probable that the campaign which the Emperor Frederic Barbarossa undertook in the summer of 1155 from Lombardy against Spoleto, came to its unfortunate end owing to the heavy losses of the army by sunstroke; for we read³ that the troops were unable to withstand the burning sun of the Italian sky.

It is remarkable that the medical writings of antiquity and the middle ages do not give the smallest hint of such occurrences, nor, indeed, any reference to the sun's heat as causing diseases that correspond in any way to our notions of sunstroke. It is not until the sixteenth century that writers began to connect the occurrence of severe strokes like apoplexies with the action of very high temperature, or, in other words, to represent sunstroke and heatstroke as a form of apoplexy brought about by extremes of heat.

Thus Cardanus⁴ says that in 1543 there were many cases of "morbus attonitus" (apoplexy) at Florence in consequence of the heat and drought of the summer. Foreest⁵ also mentions the occurrence of "apoplexy" from the same cause. Baglivi's⁶ reference to the matter, in his account of the sudden deaths at Rome in 1693 and 1695, is particularly definite: "Epidemicæ hujus apoplexiæ causa peti jure merito posset ab insueta illorum annorum aëris intemperie; aestas anni 1693 erat adeo exurens, ut squallore et siccitate omnia consumi videbantur Quæ subsequeta est aestas (1695) multo fuit ardentior superiori, et per continuos quinque menses nullæ pluviae apparuerunt."

At the beginning of the eighteenth century, the term "insolatio" was introduced into the nomenclature of disease by the school of Boerhaave,⁷ who regarded the lesion as a kind of "phrenitis." To the same period belong the first medical accounts (to be afterwards referred to) of sunstrokes

¹ Balderici, 'Episcopi Chron. Atrebat. et Carenc.', in Bonquet, 'Script. rer. Gall.', x, 201.

² Schnurrer, 'Chronik der Seuchen,' i, 225.

³ Ottonis Frising. Episcopi, 'De gestis Friderici,' i, lib. i, xxiii.

⁴ 'Comment. in Hipp. epid.,' lib. i, Opp. x, 220.

⁵ 'Epidem. lib. x, obs. 70.

⁶ 'anat. et pract.,' Append. Opp., Antw., 1715, 683.

⁷ § 772; v. Swieten, 'Comment. in Boerhavii Aphor.'

on the large scale among bodies of troops on the march. Opinions on the nature of the disease, whether it were apoplexy or inflammation of the brain, continued to be divided, until in 1819 Steinkühl¹ made an anatomical examination of the bodies of two persons who had died of sunstroke, and satisfied himself that the fatal result in both cases was due to asphyxia and not to apoplexy or any other cerebral lesion, and that "death had proceeded not from the brain and nerves, but rather from the organs of respiration and from the heart as implicated along with them." This view found favour particularly among English and American practitioners; although it did not become general, or at least it was not adopted as the sole rationale of sunstroke suitable for every case.² The attention of investigators was turned rather towards changes in the blood, and it was supposed that the real cause of the disease had been traced to quantitative or qualitative alterations of that fluid. At length the experiments of Stiles, Walther, Vallin, Claude Bernard and Jacubasch furnished evidence that the effect of unusually high temperatures on the animal body was to produce heat-spasm of the cardiac muscle; so that the question of the nature of sunstroke and heatstroke would appear now to be settled in the sense of Steinkühl; that is to say, the disease is taken to be asphyxia³ brought about by spasm of the heart ("rigidité subite du ventricule gauche," as Vallin says).

The two forms of *insolation* and *heatstroke* own the same fundamental cause—an abnormal rise of the body temperature. If we disregard the morbid changes wrought by the direct action of the sun's rays on the skin, they are both attended by the same group of morbid phenomena; and they differ from one another merely in the source of the increase of body-heat, which, in the case of insolation or sunstroke, is the sun's rays acting directly, and in the case of heatstroke,

¹ The bibliographical references will be found at the end of the section in the alphabetical order of the authors' names.

² The subsequent developments of the doctrine of sunstroke may be read in Jacubasch, pp. 22—24.

³ I have no other reason than convenience for taking Sunstroke and Heatstroke in the division on Diseases of the Nervous System. Their place in the nosology is peculiar; and it is difficult to bring them in along with any of the Diseases of Organs discussed in this volume.

is the unusually high temperature of the air. To these sources there has to be added a third—the muscular work within the individual's body; that contributes to raise the internal heat, and if it should be acting at the same time as the others, it helps materially to bring about the physiological disorder which underlies the morbid process.

§ 203. GEOGRAPHICAL DISTRIBUTION.

The *geographical area* of the malady, especially the insolation form of it, includes the larger part of the globe; but, for obvious reasons, the principal seats of it are in the tropics; and among these the countries of Eastern Asia, *India* more particularly, hold the first place in respect to the number of cases.¹ The army medical reports furnish us with a measure of the frequency of the disease in the several provinces of India, although not a certain measure.²

Sunstroke and Heatstroke among the Troops in India, 1861-73.

Presidency.	Total strength.	Admissions.	Sick-rate per 1000.
Bengal	478,229	1527	3·2
Bombay	144,398	408	2·8
Madras	148,188	363	2·5
Total	770,815	2298	3·0

It is very doubtful whether the difference in the sick-rate between Bengal and Madras is really so great as the table shows; the statistics are subject to the defect of containing only the cases treated in hospital; also it is undoubted that many cases of fatal heatstroke among the troops are introduced into the register of deaths, there as elsewhere in the tropics, under the name of apoplexy; and we have information from several parts of the Madras Presidency that heat-

¹ See the writings of Hunter, Todd, Crawford, Bonnyman, Staples and Nolan.

² From 1874 onwards the Army Medical Reports cease to specialise the various groups of diseases, so that we cannot follow the inquiry beyond that year.

stroke is common.¹ Gordon's estimate for Bengal is 4·9 per 1000 British troops; and there are many other accounts² from various parts of that Presidency which bear out the idea of the seizure being rather common. In the Bombay Presidency there appears to be most of it in Central India (Bundelkund and the adjoining territories);³ in a detachment of 417 men stationed there, 89 cases of heatstroke were met with from May to August, 1858, and of these 26 were fatal.⁴ According to the statistics compiled by Kinnis, there were in one year (1849-50) among 7458 British troops in the Bombay Presidency, 27 deaths from heatstroke, or 3·6 per 1000. Among the regions of India most subject to it are the North-West Provinces (Agra),⁵ the Punjaub⁶ and Sind.⁷ In Ceylon, so far as we may conclude from the army reports, heatstroke is much less common than on the mainland of India; in the reports from 1817 to 1836 there is not a single death put down to that cause; and from 1867 to 1873, only 16 admissions and 2 deaths occurred in a force of about 31,000 men. In the *East Indies* also, as Heymann states, sunstroke and heatstroke are rare; nor has Brander ever seen it among the population of the Andaman Islands. From *Lower India* we have only scanty information about it; Martin speaks of it as being prevalent among the Indian troops (sepoys) in the first Burmese war, and McLeod says that cases now and then occur at Singapore in Europeans owing to carelessness. In Cochin China, according to Bernard, it is a common incident among European residents. The southern and south-eastern coast of *China* suffers from it to an unusual extent; there are accounts of its occurrence, often in a very intense form, at Tien-tsin, Chee-foo, Shanghai, Hongkong, and other places; and it has often been seen in the north also, as at Peking, especially among Europeans.⁸

¹ Dick, for the Carnatic and Coromandel Coast, which Morehead also gives as a principal seat of the malady; Bisset for Mysore; Sheriff, McGregor, Shanks, and others.

² See the papers by Mount, Longmore, Butler and Clark.

³ Arnott, Pirrie, Barclay.

⁴ Simpson.

⁵ Lindesay, McGregor, Harthill, Taylor, Brougham, Lowe.

⁶ Gibson, Chapple, Baxter, Curran.

⁷ Don, Hefferman.

⁸ Friedel, Thiu, Morache, Mourson.

The shores of the *Red Sea* and *Persian Gulf* are notorious for the frequency of sunstroke and heatstroke; in particular there are many references to the disasters that they have caused on board transports and ships of war navigating those waters or stationed at places on the coast.¹ In *Syria*, also, travellers who carelessly expose themselves to the sun not unfrequently incur sunstroke;² and it would seem to be a not altogether rare incident in Transcaucasia.³ Our information about it from *Africa* is but scanty; we may conclude, however, that the malady is on the whole decidedly less frequent in that continent than in the Asiatic countries of which we have just been speaking. Among the principal seats of it are the valley of the Nile in *Egypt* and *Nubia*;⁴ the Libyan desert, where the caravans from Suez to Kenneh suffer much from it;⁵ *Algiers*, where the French troops, and the Arabs as well, had serious losses from sunstroke in the military movements of 1834, 1835, 1838, and 1843;⁶ and *Senegambia*, from which the recent accounts by Mondot, Thaly, and Borius give a decided contradiction to the earlier statements of Thevenot and Dutroulau, alleging that the incident was rare. But on the *West Coast of Africa* the rarity of sunstroke or heatstroke is undoubted and remarkable; Clarke's declaration on this point, that "attacks of coup-de-soleil are of rare occurrence, . . . even Europeans are not subject to the sunstroke," is fully borne out by British army medical reports: from 1819 to 1836 not a single case is reported, and according to the returns from 1857 to 1863 there were only 10 cases among 15,574 men forming the garrisons of Sierra Leone, the Gold Coast, and the Gambia Coast. It has to be kept in mind, however,

¹ Respecting the Persian Gulf, see Moore and Wellsted; the latter gives an account of the occurrence of heatstroke on board H.M.S. "Liverpool" during the passage from Muscat to Bushire in the summer of 1831: she lost three officers and thirty men in one day. See also the 'Reports on the Health of the Navy.' For heatstroke in the Red Sea, see the same annual reports, and the papers by Little, Texier, Vauvray, Borius (l. c., p. 245), Roch and Mourson.

² Robertson.

³ Hirtzius.

⁴ Hartmann.

⁵ account of sunstroke in the French Army of the the Libyan desert ('Relat. histor. et chir. de

ptice relating to Biscara by Zuber.

that we have here to do with native troops; and, that Europeans have to be careful in these as well as in other regions of the tropics, is obvious from the statement of Férus that sunstroke is not unusual on the Slave Coast and that the European residents cannot venture to go out of doors in the hot season before sunset. Along the coasts of *South Africa* the malady is not often met with;¹ but in the interior it is common in those regions, with an almost tropical climate, which slope downwards from the plateau towards the Zambesi on the north and to the sea coast on the east. From East Africa I do not know of a single statement relating to sunstroke; in *Mauritius* it is reported by Allan to be common (unusually so in 1824 and 1825); on the other hand, Guiol emphasises the fact that only 12 cases were known in Nossi-Bé in nineteen years (1862-80), and that he himself had met with only one case in two years.

From *Australia* I have only one notice of it, by Bourse, who says that it occurs often in labourers and children who expose themselves to the sun on the treeless plain of Sydney during the summer season (December to February); and it is comparatively frequent among the crews of British ships-of-war on the Australian station. It is the more remarkable to learn from Cousyn that in Nouméa (*New Caledonia*), notwithstanding the tropical climate, only one case occurred among the marines during two years, and only two or three cases among the troops on shore.

Sunstroke among bodies of troops in Europe.—In *Europe* sunstroke, and certainly heatstroke, count among the rarer forms of disease. Insolation occurs oftenest in troops on the march, whether in time of war or in ordinary exercises.¹ Schmucker relates that large numbers were attacked by sunstroke in the army of Frederick the Great on August 6th, 1760, during the march from Marienstern to Bautzen, and that about 100 of the men died of it. During the Bavarian

¹ Fritsch; Barclay also says that he has seen several cases of heatstroke among the English troops on the Great Fish River.

² According to an enumeration by Jacobasch (pp. 26, 27), there were 265 cases and 72 deaths in the Prussian army from 1867 to 1874 (March), in a total strength of 1,623,950 men; in the Austrian army from 1870 to 1875, in a strength of about 1,287,000 men, there were 81 cases of heatstroke with one death.

War of Succession there was a terrible episode on July 2nd, 1778, when sunstroke befell the army of Prince Henry on the march from Bernburg to Dresden, as related by Mursinna. Other severe attacks of it were the following: on May 21st, 1827, among the Prussian corps of Guards during manœuvres between Berlin and Potsdam;¹ in July, 1839, among a body of Austrian troops in the campaign against Dalmatia;² in June, 1848, among Prussian soldiers on the march from Posen to Glogau;³ on July 8th, 1853, among Belgian troops marching 600 strong from the camp of exercise at Beverloo to Hasselt, a distance of four leagues: they lost 450 men, so that only 150 reached Brussels safe and sound;⁴ in July, 1854, during the Crimean war, among Russian troops on the march between Bucharest and Kimpine, so that of 6000 men only half the number reached their destination; at the same time, in the Dobrudscha, among the French troops, who had also terrible losses;⁵ in July, 1859, among the French army at the passage of the Mincio, 2000 out of a force of 12,000 men being attacked by sunstroke (Guyon, ii); a little later in the same summer among the Austrian troops at the passage of the Adige (Michaelis); in July, 1866, among the Austrian troops (Thurn); in July, 1870, in the Pommeranian army corps on the march not far from Berlin (Arndt); in July, 1873, among the Bavarian troops before Sedan, and almost at the same time in a division of Baden troops on the march from Burg Hohenzollern to Rosenfeld;⁶ in August, 1875, among a battalion of infantry engaged in manœuvres near Fraustadt in Silesia;⁷ in July, 1877, among French troops during a review at Longchamps (Lacassagne); and in July, 1878, among the Austrian army of occupation in Bosnia.⁸

It is a noteworthy fact that nearly all these outbreaks have happened in July; and the same is true of the malady

¹ Riecke.

² Joachim.

³ Account in 'Berlinische Nachrichten,' 1848, No. 14.

⁴ Account in 'Magdeburgische Zeitung' of 14th July, 1853.

⁵ *Ib.*, 12th July and 9th Sept., 1854.

⁶ Jacobasch, p. 19, according to private letters from surgeons of the Bavarian army.

⁷ *Id.*, p. 20, also from private letters.

⁸ Account in 'Wien. med. Wochenschr.,' 1878, No. 39, p. 1053.

when it has occurred in Europe (much more rarely) among non-military groups of people. It has been comparatively common in *Turkey* (Rigler); and it has been often seen among the crews of English and French ships-of-war on the *Mediterranean station*. From *Spain* we have information about sunstroke by Murray; and the same writer, confirmed by Ziermann, relates that there were many cases among the British troops in *Sicily* in 1808, shortly after their arrival there. For *Italy* I have notes of a number of cases at Turin in July and August, 1828, among bricklayers who had been at work in the sun during the hottest hours of the day;¹ and of eight deaths from sunstroke among reapers near Rome in July, 1853. From *France* there is an account by Henry of a number of cases in May, 1848, at Arnville (Dept. Meurthe), among women occupied at the sheep-washing; and another by Duclaux for the arrondissement of Villefranche (Haute-Garonne), where a number of field labourers, and subsequently others, were struck down by it in the hot summer of 1859. In *Germany* there have been the following groups of cases: in July, 1819, near Schweinfurth, among labourers in the hay-field (Steinkühl); in July, 1833, at Berlin in a number of persons who had been exposed to the direct rays of a very hot sun (Joel); in July, 1845, among field-labourers in several parts of Würtemberg (Schott); in the summer of 1847 in a number of villages near Jena (Siebert); in June, 1865, near Nentershausen (Bauer); and in the summers of 1873 and 1880 near Allershausen (district of Freysing, Upper Bavaria), the cases in the former year, according to Meyer, being 106, and in the latter 108. From *Britain* there are accounts of the same kind relating to field-labourers in several parishes of Middlesex² in July, 1855, and to various parts of England and Scotland in the month of July, 1868, which was remarkable for its great heat.³

In the *Western Hemisphere*, the region of the United States between the Atlantic and the Alleghanies is a principal seat of sunstroke and heatstroke; in very hot summers the number of cases, many of them fatal, has over and over again reached

¹ Account in 'Repertorio med.-chir. di Torino,' 1825.

² Notice in 'Lancet,' 1855, July, 38.

³ Strange, Bullar, Bennett, Wrench, M'Kendrick, &c.

a terrible figure. Our more particular information comes from *New York*¹ and *Philadelphia*.² In the former city, the deaths from sunstroke in August 1853 numbered 224, in 1863 they were 135, in 1866 they reached 230,³ in 1868 up to the 28th of July 833 persons had died of it,⁴ in June, July, and August of 1870 there were 238 fatal cases,⁵ and in June and July of 1872 nearly 1000 cases occurred, the deaths up to the 6th of July being 230. In that summer also (1872) many other cities in the coast States, such as Brooklyn, Philadelphia, Washington and Baltimore, had an almost equally severe visitation, so that all the hospitals were full of patients with sunstroke.⁶ There are similar accounts from Philadelphia in 1866⁷ and 1870, as well as 1872;⁸ in 1870 the deaths in the summer months were 52, but in 1872 they rose to 137.

This predominance of sunstroke on the Atlantic seaboard would appear to extend also to *Canada*, *Nova Scotia* and *New Brunswick*; in evidence whereof is the not inconsiderable number of cases among the British troops, such as came under Mitchell's observation at Lake Champlain in 1835; and the statistics of mortality from 1859 to 1873, which show that there were 28 cases and 8 deaths from sunstroke during that period in a total strength of about 125,000 men. From the *Central States* of the Union we have a number of references to the disastrous incidence of sunstroke: thus, in Cincinnati in 1881, 288 persons died of it between the 14th of May and the 8th of September, 54 of them on a single day, the 12th of July;⁹ St. Louis, Mo., has had several severe visitations of it (Reyburn), the number of seizures in the city during the year 1878 being estimated at 1500; and there have been many victims at various places in Indiana and Illinois. From the Western States we have absolutely

¹ See the papers by Lente, Darroch and Swift.

² Hartshorne, Pepper, Condie, Levick, Wood.

³ 'Brit. Med. Journ.,' 1868, Septbr., 314.

⁴ *Ib.*, 1868, Aug., 111; Septbr., 314.

⁵ 'First Annual Report of the Board of Health of the City of New York,' 1871, p. 179.

⁶ 'Brit. Med. Journ.,' 1872, July, 101.

⁷ 'Amer. Journ. of Med. Sc.,' 1866, Oct., 573.

⁸ 'Transact. of the Pennsylvania State Med. Soc.,' 1873, 194.

⁹ 'Brit. Med. Journ.,' 1882, Aug., p. 216.

no information about sunstroke or heatstroke ; from the Southern States also, there are only a few notices, which enable us to infer that the malady is common in *Florida*,¹ *Mississippi* (Yazoo County),² and *Louisiana* (New Orleans).³

The experiences of the War of Secession from 1861 to 1865 serve to show how much more numerous the cases among the troops may become during military operations.⁴

Sunstroke in the Federal Army of the United States (White Troops).

Period.	Total strength.	Cases.	Deaths.
May—July, 1861	41,556	74	1
July, 1861—June, 1862	279,371	416	18
" 1862— " 1863	614,325	1221	48
" 1863— " 1864	619,703	2388	73
" 1864— " 1865	574,022	2168	89
" 1865— " 1866	99,080	350	32
	2,228,057	6617	261

Corresponding Table for Black Troops.

Period.	Total strength.	Cases.	Deaths.
July, 1863—June, 1864	43,952	111	8
" 1864— " 1865	83,571	252	32
" 1865— " 1866	55,031	220	18
	182,562	583	58

According to these figures, the number of attacks was nearly 3 per 1000 men, and the deaths 0·13 per 1000 ; of those attacked, 4·4 per cent. died.

On the Mexican Gulf Coast sunstroke is more common and more fatal. Delacoux says that there was a frightful

¹ Bennett.

² Peake.

³ The tables are taken from the 'Medical and Surgical Dictionary,' Washington, 1870, pp. 638, 711.

tality from it among the men engaged in making the railway from Vera Cruz ; and that seven ships taking in cargoes of Campeché-wood together at the island of Carmen off the coast of Yucatan lost the greater part of their crews from sunstroke in a few weeks. Celle mentions that deaths from heatstroke are common among beasts of burden (horses and mules), in the same part of the world.

In remarkable contrast to the frequency of the seizure in those parts of the North American continent of which we have spoken hitherto, is the comparative immunity of the *Pacific Coast*. According to Blake and Gibbons there was hardly anything heard of sunstroke among the gold-diggers in California. The same would appear to hold for Central America ; at all events, Lidell says that he saw only two cases of sunstroke among the thousands of men working at the railway across the Isthmus of Panama. Most of the authorities are silent about sunstroke in the *West Indies*, and the figures given for it in the 'Army Medical Reports'¹ for the British troops in Jamaica and the Lesser Antilles are very small ; but it seems to me very doubtful whether we should infer therefrom that the disease is rare. Lemprière² calls attention to the danger of exercising the troops in Jamaica during the hot part of the day, although he does not mention what consequences follow from neglecting that rule ; Chisholm, again, in his account of the diseases of the West Indies, emphatically says that "coup-de-soleil frequently occurs in the hotter months ;" and Oliver states that he has often seen it at Alquizar in Cuba. In the *Bermudas*, at least, it is not uncommon, if we may judge from the number of cases among the troops (15 cases and three deaths from 1859 to 1873, in a total strength of about 20,000 men). Among the *South American* countries most subject to it, so far as our information enables us to judge, are *Guiana* (Campet, Laure, Dutroulau), *Brazil* (Sigand, Mantegazza), and the forest region of *Peru* (Tschudi). In the *States of the River Plate*, also, it is not unfrequently destructive (Brunel) ; there are particulars from

¹ In these Reports, besides the "sunstroke" cases, we find very considerable totals under the heads of "phrenitis" and "apoplexy." We may reasonably conjecture that these last included a good many cases of insolation.

² 'Pract. Obs. on the Diseases of the Army in Jamaica,' Lond., 1799, i, 272.

that country relating to the summer (December) of 1861, when many cases of sunstroke occurred at the port of Maldonado (Uruguay) among marines who were being exercised on shore.¹

§ 204. JULY THE PRINCIPAL MONTH FOR SUNSTROKE.

The sketch that we have given of the geographical area of sunstroke and heatstroke is an imperfect one; but the foregoing facts suffice at least to place beyond doubt the fact that it is most frequent in the tropics, that the cases become fewer as we reach higher latitudes, and that we come at length to a northern limit beyond which the disease is not met with at all. That limit, according to the information before us, is about 60° N. in the Eastern Hemisphere (at St. Petersburg there were cases of sunstroke in the hot summer of 1831);² and, in the Western Hemisphere, it falls near the fiftieth parallel, or the latitude of Newfoundland. There can hardly be any question that these differences in the number of cases at various parts of the world depend on their *climate*, and more particularly on their temperature; for experience shows that sunstroke and heatstroke hardly occur in extra-tropical countries except when the weather has assumed a tropical character, and in particular the temperature gone up to a high point; it shows also that the greatest incidence of the malady, in lower latitudes as well, is in the hottest *seasons* of the year. In India the largest number of cases occurs from April to July, varying with the situation of the place, or, in other words, with the early or late setting in of the rains. Accordingly it falls as early as April in southern regions, such as the Carnatic (Dick); in May or June in Central India; and in June or July in the North-West Provinces and Sind. When the rain begins the temperature falls and the cases become fewer; but they mount up again when the rainy season ends in September or October, the air being very hot and saturated with watery vapour; and they cease altogether when the cold season sets

¹ Dupont.

² Doepf in 'Abhandl. deutscher Aerzte in Petersb.,' 1828, v.

in.¹ The same relationship to season or weather is manifested by sunstroke in other tropical countries, such as China, the West Coast of Africa, the West Indies and Peru. In subtropical and temperate latitudes of the Northern Hemisphere sunstroke and heatstroke happen nearly always in July, more rarely in August; in the Southern Hemisphere, mostly in January, which is the hottest month, and principally in very hot years, according to nearly all the accounts.

§ 205. DIRECT ACTION OF SOLAR HEAT AIDED BY
CIRCUMSTANCES.

The influence of the temperature, as we have seen in the earlier paragraphs of this chapter, may be exerted in one or other of two ways. Either the sun's rays come to bear directly upon the organism, as in sunstroke or *coup-de-soleil*; or the effect is that of a heated atmosphere, as in heatstroke or *coup-de-chaleur*. In either direction the influence of the disease-producing factor may be modified, that is to say, increased or diminished, by collateral causes. The effect will be more certain, more rapid, and more intense, in proportion as there is at the same time an increased production of heat within the individual's body; or if there be some check to the discharge of heat, especially by way of radiation from the surface; or if the sensibility of the individual to high temperature remain uncontrolled by use and wont, or his power of resistance be lowered by age, constitution, or general ill health. That is how we explain the effect of a number of things in the meteorology, locality, manner of life, occupation, and personal idiosyncrasy, upon the frequency of the disease, a frequency which varies under the same temperature at different times and in different places.

"On the table-land of India," says Hunter, "insolation is much rarer even under higher temperatures than on the plains and in the regions near the coast; during the campaign of 1839 in Afghanistan, where the troops were exposed not unfrequently to a temperature of 98° F., there were only two cases in one regiment." On the West Coast of Africa and in Senegambia, where the temperature in the hot season is as high

¹ Bonnyman, Nolan.

as in India, and for the most part higher, heatstroke and sunstroke are decidedly rarer than in the latter country; and the same is the case, as we have seen, in Panama. Barclay, in his account of sunstroke at the Cape says: "In the military posts at the mouth of the Great Fish River, as well as in the other posts up the valley, the thermometer during the hot season is often higher than at Indian stations, and I have seen it exceed 100 F. every day for three weeks inside a house protected by a good roof; during the time that I served there the European troops were occupied in extracting stones from an adjoining quarry and in building a bridge with them; but there was not a single case of sunstroke among the men the whole of the time." Perrier, in his paper on *coup-de-chaleur* in Algiers, says that he would be far from assigning high temperature as the sole cause of it; and Seriziat states that he saw no well-marked case of sunstroke or heatstroke during the campaign of 1864 in the Algerian Sahara notwithstanding the enormous heat. Dowler points to the frequent occurrence of it in Louisiana and other Gulf Coast States, while regions with a much higher temperature are but rarely affected by it. The difference is still more remarkable between the Atlantic States on the one hand, where we have seen the disease to be very common and destructive, and California on the other.

"There is one fact," says Blake, "with which I have been struck whilst travelling in the mountains during the last summer: viz. the rare occurrence of *coup-de-soleil*. It might be supposed that the miners would be peculiarly liable to this disease, exposed as they are for hours to the burning rays of the sun, and frequently with their feet in ice-cold water; yet I have never seen or even heard of an instance of sunstroke, although the rays of the sun are certainly more powerful here than in most of the Atlantic States." And that is confirmed by Gibbons: "It has been remarked that, notwithstanding the constant exposure of a large portion of the male population to the extreme heats of the interior [of California] sunstroke is scarcely ever heard of."

§ 206. MOISTURE IN THE AIR AN IMPORTANT FACTOR.

Next to temperature *the degree of moisture in the air* has a very decided influence on the occurrence of sunstroke and heatstroke. Its greatest prevalence, as we have seen, falls in the season which precedes the rains and in that which follows them, when the air is saturated with watery vapour and makes the feeling of sultriness.

"It is the subject of common remark in India," says Gordon, "that one of the meteorological conditions under which heat-*apoplexy* chiefly occurs, is when the breeze for a time ceases, the sky becomes obscured by a film of dark, negatively electrified clouds, and a sense of oppression

hangs like a weight upon the mental as well as bodily energies;" and in another passage: "Indian officers say the heat is not so much to be feared during the intensity of the dry heat, as in those calm sultry days when the sun is obscured by a film of clouds."

To the same effect Oliver writes in his paper on sunstroke in Cuba, that it was mostly seen there in suffocating heat and great dampness of the atmosphere. Harthill, referring to the cases of *coup-de-chaleur* at Agra in 1840, says that the first of them occurred as the temperature went up at the time when the rains suddenly ceased, and very hot sweltering weather set in. Longmore characterises the weather while the disease was prevalent at Barrackpore, as "hot, sultry and oppressive;" and in almost the same words ("sultry and oppressive state of atmosphere") Butler describes the kind of weather under which the cases occurred at Mean Meer in 1859. Brougham says with respect to the production of heatstroke: "A temperature of 120° in a dry air has been borne without any inconvenience, and even a greater degree of heat has been endured without injury; but probably not half the temperature, as indicated by the thermometer, could be borne with impunity where even a moderate quantity of vapour was present. There is another effect also produced by a moist atmosphere; not only is the heat more rapidly conducted to the body, but the perspiration remaining on the surface no longer cools the frame by evaporation. The armour which defended in the dry, is no longer a protection in the moist air; so that altogether the effect produced can never be estimated by the thermometer alone."

We find the malady occurring under the same hygrometric conditions in most other countries: as in the forest region of Peru, according to Tschudi, amidst suffocating heat and in an atmosphere laden with moisture; and, according to Brunel, in the River Plate States during the hot and moist winds from north and north-east. Meyer assigns the chief importance in the meteorology, at the time of both the severe epidemics of sunstroke which he saw in Upper Bavaria, to "heat, moisture, low barometer, calms, and frequent thunderstorms." The experience also of Dowler, Swift, Levick and other United States practitioners is in favour of the influence of much atmospheric moisture in producing the malady.

I shall have another opportunity (p. 648) of pointing out how important that factor is in the etiology when the disease occurs in confined places. Its significance in the pathogenesis will be found, speaking generally, to be that an atmosphere laden with moisture reduces to the lowest point the evaporation of the sweat which is poured out under a high temperature, so that one of the most important regulators of the heat fails in its office, and the abnormal rise of the body-temperature remains uncompensated.

§ 207. INFLUENCE OF HOT WINDS OR LOCAL CURRENTS OF AIR.

The facts here adduced enable us to measure the influence exerted in this malady by the *air at rest or in motion*, in so far as it has a determining action on the atmospheric heat and moisture. Nearly all the Anglo-Indian authorities are of opinion that sunstroke is commonest when the air is absolutely calm, the temperature being at the same time high and the atmospheric moisture great. In like manner writers in other parts of the world inform us that they have seen cases of sunstroke mostly when the atmosphere was in the condition commonly called sultry, and that these have always become fewer when cooler and drier winds set in. Again, there are other observations serving to prove how greatly the currents or draughts of hot and damp air may conduce to sunstroke or heatstroke. Thus Brunel points out that the malady is prevalent in the River Plate States even in spring, under the influence of hot and damp northerly or north-easterly winds blowing from the plains of Brazil. Rigler says that cases are unusually common at Constantinople while the south wind is blowing; and the same thing has been noticed in Italy at the time of the sirocco, and in Egypt during the kamsin. Lindesay informs us that the malady appeared in 1833 in Chunar (Bundelkund, Central India) when a burning hot wind set in suddenly from the west after a long tract of east winds, and that the cases ceased when the wind again went round to the east. Mouat also observed that cases of it occurred among British troops on the march from Calcutta to Berhampore on the sudden setting in of an excessively hot wind; and under the same circumstances McGregor in 1840 saw heatstroke become prevalent in Kampti, and cease when the hot wind stopped, and rains had cooled the air. There are accounts of the same kind by Taylor (for Gazipore in 1840) and by other Anglo-Indian practitioners.

The occasional narrow limitation of the disease finds an explanation in these hot winds blowing over a particular locality. The occurrence of cases not so frequently at some

one particular spot is connected also with the *nature of the soil*, including the geology and configuration, these being things that affect the meteorological conditions of the place; more especially we may note open sandy or stony plains which absorb heat as freely as they reflect it, and deeply cleft, damp valleys or defiles, where the air is often close or absolutely stagnant under a high temperature.

§ 208. MUSCULAR FATIGUE HELPS TO BRING IT ON.

An important element in the causation in many cases, as we have seen, is the *increase of the body-heat from muscular exertion*, taken along with the unusual heating of the body by the external temperature. Among the civil population, accordingly, it is mostly in field labourers during harvest that we meet with sunstroke, particularly at times when there are increased demands on their exertion;¹ also among artisans, such as bricklayers and carpenters, who are obliged to work in the open air in great heat; and among all such persons as undergo severe labour in the like circumstances. But this factor in the disease operates much more frequently, as we have seen, among bodies of troops during fatiguing marches. The terrible sacrifices which this disease has exacted time after time from nearly every army in Europe, have been brought about exclusively under circumstances of fatigue; Smart and other United States medical officers give the same account of sunstroke during the Secession War, the cases among the Confederate troops having been more numerous the farther south the scene of action and the more exhausting their marches; and the army surgeons in India have had still more numerous opportunities, as will be readily understood, of ascertaining the effect of that factor in the causation.

¹ See the observations on this point made in Upper Bavaria by Meyer, l. c., p. 294.

§ 209. MOST OF IT WHERE MEN ARE CROWDED TOGETHER.

The liability of troops on the march to sunstroke requires us to consider still another and not less important circumstance. The close company of a number of persons not only contributes to raise the temperature, but the human effluvia tend to *corrupt the air* in which the troops are moving and breathing. Niebuhr, in his account of the customs of the Romans, has pointed out that they correctly appreciated the fact that nothing tires troops on the march so much as keeping in close order; their commanders accordingly did what they could to obviate that evil, and the value of the practice has been recognised by all military surgeons of recent times.

Taylor says: "The fact is that 'crowding' out of doors, especially in a tropical climate, is to be condemned as well as crowding in barracks. There is with our military men too much fancy for close order of ranks and companies and columns. . . . Several explanations have been offered to account for the fact that cavalry and artillery are more healthy than infantry. Now, one reason appears to me to be the less compacted or congregated order of the men of the two former arms during their parades and military movements, and the generally smaller masses of which the parades of these classes of troops are composed. The artilleryman at his gun and the cavalry soldier on his horse or at sword exercise on foot, must be admitted to be more healthily circumstanced than the infantry soldier, moving with his arms and chest cramped, breathing the foul atmosphere pervading closely-locked ranks, close columns, and squares. . . . No one who has moved with a close column of infantry in India, or indeed elsewhere, can be sceptical of the unwholesome atmosphere surrounding such masses of men." On one occasion, when he accompanied a regiment on the march to Ferozepore, indications of sunstroke began to appear; he got the commandant to permit the men to march as far apart as possible, and the effect was so good that the regiment for the rest of the distance lost only one man by sunstroke.

The same view has been adopted by Gordon, Guyon (II), and other army medical officers. Guyon, referring to the fact that the infantry, speaking generally, suffer more from sunstroke than the other arms of the service, emphasises especially the greater bodily fatigue that they undergo on the march.

§ 210. PREFERENCE FOR INDIVIDUALS ; ACCLIMATISATION.

Individual predisposition is an element not to be underestimated in judging of the incidence of sunstroke and heatstroke ; and in that connexion, apart from the influence exerted by age, sickness, alcoholism and the like in the way of lowering the power of resistance, we have most of all to keep *acclimatisation* in view. The effect of that will naturally be seen most in the tropics ; and it is shown in the fact that the malady is much rarer there among the natives than among foreigners, and that even the latter acquire a certain degree of protection from sunstroke after a considerable residence in or acclimatisation to lower latitudes.

" Observation seems to justify the conclusion," says Pirrie, " that who has newly come to a tropical climate, though he be temperate in all things, and placed in equally favorable circumstances with an old resident, will, if exposed to the exciting causes after prolonged exhaustion, be more liable to an attack of sunstroke than one who has passed several years of his life in the same high temperature. Amongst the many cases of sunstroke that occurred in the Central Indian Force, the troops composing which were in similar circumstances with respect to rest, fatigue, and food, by far the greater number of seizures occurred amongst those who had recently arrived in that country. I have, moreover, seen European children, born and brought up in India, run and play about exposed to the sun with perfect impunity, whilst men newly arrived in the country were attacked with sunstroke."

It is in the same sense that nearly all the Indian authorities write, such as Sheriff, Bonnyman, Auboeuf and Brander (for the Andaman Islands) ; also those on the West Coast of Africa, Morache for Pekin, and others. Even in temperate latitudes, acclimatisation has a certain limited effect. Thus, Ziermann says that cases of insolation began to grow rarer among the English troops after they had been some time in Sicily.

This immunity of natives and the acclimatised, it need hardly be said, is only relative ; and it proves insufficient when the circumstances are peculiarly trying. Perrier, for example, mentions the terrible disasters from sunstroke among the fugitive Arabs in Algiers at the time of the French occupation, his words being : " La fuite de la zmla d'Abd-el-

Kader en 1843 a fournie un exemple : à chaque gâte, disent les Arabes, nous laissons un petit cimetière." In Barclay's account of the cases at Bundelkund (Central India) in 1853, it is stated that the heat was so overpowering that even the native troops were attacked by sunstroke and died, some of them in an hour or less. In Martin's account of sunstroke during the Burmese War, in which he served as a surgeon in the cavalry, he mentions that, on a certain day (May 12th), the Sepoys, both native officers and men, were attacked by sunstroke in large numbers and fell from their saddles, although there was not a single case among the European officers either on that day or before or after. We have information of the same kind by Gibson for Gujerât, and by Lindesay for Chunar.

§ 211. RESPECTIVE CIRCUMSTANCES OF SUNSTROKE AND HEAT-STROKE.

I shall devote a few words here to the variety of type, whether sunstroke or heatstroke, at different parts of the globe.

In temperate latitudes by far the most of the cases belong to the type of *sunstroke*, for the reason that it is only rarely that the temperature in the shade or within doors ever reaches such a height as to heat the body up to the point of heatstroke. The latter type has not been seen except under quite excessive temperatures, or in places where artificial heating has brought the temperature up to some such abnormal height. Swift saw eleven cases of heatstroke in New York at a time of very great heat, in persons employed in a laundry, as well as several cases in men who were working in a sugar refinery. Levick says that the first case seen by him at Philadelphia in the hot summer of 1858 was in a man who had been ten hours on and in a sugar refinery, where the illness came upon him. There are observations of the same class from New York and Philadelphia in 1872, when the temperature of July reached a height of nearly 30° C. (86° Fahr.) in the shade, a number of cases having occurred between midnight and six in the

morning in persons who had gone to bed perfectly well. When the malady was prevalent in the summer of 1854 in the arrondissement of Villefranche, the first subjects, as Duclaux tells us, were field labourers; but afterwards persons were attacked who had not been exposed to the sun's rays at all. The same thing was noted by Bauer in 1865 at Nentershausen (under a temperature of 31° C. or 87° Fahr.), by Meyer in Upper Bavaria in 1866, and by Thurn among the Austrian troops in the campaign of that year, cases occurring not only when they were on the march but when they were in quarters.

In subtropical and tropical countries, *heatstroke* is as common as *sunstroke*, and perhaps more common.

Referring to the cases in Bundelkund in 1853, Barclay says: "The attacks of heatstroke took place, with few exceptions, when the men were in their tents; most of them were in the daytime, but some of them were in the night, and only a single case occurred on the march. Usually those attacked had been lying quite still, and of course, with hardly anything on, many of them asleep or at least trying to sleep." Longmore says that at Barrackpore the same year (1853), among 16 cases which he saw, 7 were in the barracks, 6 in the hospital, and only 3 in persons who had been on guard out of doors. Dempster, who saw cases in 1849 among the English troops in Mooltan ($30^{\circ}8'$ N. in the Sikh States), says that the fatal attacks usually began about three in the morning, or long before the sun was up. The same is stated by Staples, Bonnyman, Gordon and others who had served in India. Gordon sums up as follows: "Generally speaking it is not among the soldiers who are permitted to indulge in out-door amusements at all hours of the day and at all seasons of the year, that this disease is found chiefly to prevail; but it is among those who from compulsion or inclination are much within doors during the intense heat of the day, that it principally occurs."

There are similar accounts from other parts of the tropics, such as China; thus Friedel, referring to Tien-tsin in the summer of 1861, says: "Both in the soldiers' quarters and in the lazaret-buildings it happened as early as the middle of July to healthy men and convalescents, who had been sitting quietly and unapprehensive on chairs or benches under shady verandahs or in courts covered over with matting, to be suddenly struck as if with lightning when they got up and took a few steps across the court; they fell down dead, and no efforts could bring them round." Taylor says that the malady attacked both soldiers in barracks, and ladies in the cabins of boats on the Ganges. The latter situation reminds us of the fact that heatstroke is notoriously common on board ships navigating tropical seas.

The Persian Gulf and the Red Sea are specially dreaded in this respect.

Texier mentions several cases of heatstroke on board a transport on the passage from Suez to Saigon; Roch saw on board a ship-of-war stationed on the Abyssinian coast in the months of May and June, 1868, a series of cases of heatstroke, mostly in convalescents lying in their berths.

That instances of the same kind occur in other parts of the tropics is shown by a paper of Yandell's, according to which 100 out of a company of 600 on board a French ship-of-war in the harbour of Rio de Janeiro were attacked by heatstroke, most of them during the night in the suffocating atmosphere of the hold.

The reason of attacks of heatstroke being commonest in ships' 'tween-decks, barracks, hospitals, and the like, is not merely the height to which the temperature may rise in these places, but also the tainted air from overcrowding and want of ventilation; for that, as we have already seen, plays no inconsiderable part in the pathogenesis.

Sunstroke in animals.—Lastly, I have to refer to the fact that sunstroke has been seen in various species of animals under the same circumstances as in men. One of the earliest notices of that occurs in the passage already cited (p. 626) from the chronicle, concerning the sunstroke at Aix in 1022. In the account relating to New York in 1847, it is stated that animals as well as men, and most of all omnibus horses, fell down in the streets and died. Guyon mentions that in the Italian campaign of 1859, at the passage of the French army over the Mincio, the cattle, dogs, and beasts of burden perished of sunstroke in heaps. The same thing has been seen in Algiers, in Central India according to the experience of Staples in 1867 (dogs and horses), and in Mexico according to Celle. There is no means of deciding whether these cases in animals were all cases of sunstroke, or whether heatstroke occurred among them also.

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CHAPTER XXII.

SKIN DISEASES.

§ 212. GENERAL FACTS OF THEIR DISTRIBUTION.

Chronic diseases of the skin are among the principal localised maladies of the body that occur in great numbers and in widest diffusion in all parts of the world. They are tolerably common in arctic latitudes: as in *Greenland*,¹ *Iceland*,² the *Farøe Islands*,³ among the inhabitants of the northern parts of *European Russia* (the Samojeds and tribes allied to them), *Siberia*⁴ and *Kamschatka*;⁵ still more common and in greater variety in equatorial and subtropical countries. Bajon,⁶ in his account of the diseases of French Guiana says: "Nowhere are diseases of the skin so numerous and the means of curing them so little available as in hot countries;" and we hear the same opinion, or something like it, from the medical authorities in *Peru*,⁷ *Brazil*,⁸ the *West Indies*,⁹ *Nicaragua*,¹⁰ the *West Coast of Africa*,¹¹ *Senegambia*,¹²

¹ Lange, 'Bemaerkninger om Grønlands Sygdomsforhold,' Kjöbenh, 1864, 26; account in 'Sundhedskolleg. Aarsberetning for 1854,' 41.

² Schleisner, 'Island undersøgt, &c.,' ib., 1849, 26.

³ Manicus, 'Bibliothek for Laeger,' 1824, 15; Panum, ib., 1847, i, 280.

⁴ Haupt, 'Med. Ztg. Russl.,' 1845, 375.

⁵ Bogorodsky, ib., 1854, 10.

⁶ 'Nachrichten zur Geschichte von Cayenne, &c.' From the French. Erfurt, 1720, iii, 23.

⁷ Tschudi, 'Oest. med. Wochenschr.,' 1846, 471, 507, u. a. O.

⁸ Pleasants, 'Amer. Journ. of Med. Sc.,' 1842, July, 88; Sigaud, l. c., 397.

⁹ Desportes, 'Hist. des malad. de St. Domingue, &c.,' ii, 123; Levacher,

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¹⁰ Bernhard, 'Deutsche Klinik,' 1854, Nr. 10.

¹¹ Abelin, 'Étude méd. sur le Gabon,' Par., 1872, 31; Moriarty, 'Med. Times and Gaz.,' 1866, Decbr., 663, and Michel, 'Note méd. rec. à la Côte d'Or,' Par., 1873, 42 (Gold Coast); Férus, 'Arch. de méd. nav.,' 1879, 1 Falkenstein, in 'Virchow's Archiv,' 1877, Bd. 71, 421.

¹² Chassaniol, 'Arch. de méd. nav.,' 1865, Mai, 51; 187; Rey, ib., 1877, Juni, 401.

Morocco,¹ Algiers,² Tunis,³ the Soudan,⁴ Abyssinia,⁵ Egypt,⁶ Nossi-Bé,⁷ several archipelagoes of Polynesia,⁸ Japan,⁹ China,¹⁰ Cochin China,¹¹ the Malay Archipelago,¹² India,¹³ Persia¹⁴ and Syria.¹⁵

¹ Account in 'Med. Times and Gaz.,' 1877, July, 96.

² Herrmann, 'De morbis qui Algerii occurrunt,' Herbipoli, 1833, 30; Furnari, 'Voyage méd. dans l'Afrique septentrionale,' Par., 1845; Bertherand, 'Mém. de méd. milit.,' 1842, tom. lii, 164; Cambay, ib., 1844, tom. lvii, 1; Armand, 'Médecine et hygiène des pays chauds,' Par., 1854, 419.

³ Ferrini, 'Saggio sul clima e sulle precipue malattie di Tunisi,' &c., Milano, 1860, 181.

⁴ Nachtigal, 'Sahara und Sudan,' 2 Bde., Berl., 1879, 1881; Bd. i, 149 (for Murzuk, Fezzan); Bd. ii, 469 (for Bornou): "The numerous class of skin diseases," he says in this passage, "is much more universally diffused than in European countries." And he goes on to say that he met with a number of affections of the skin and subcutaneous tissues which had not come under his notice either in the desert or on the North African Coast.

⁵ Courbois, 'Observ. topogr. et méd. rec. . . en Abyssinie,' Par., 1861, 33.

⁶ Pruner, 'Krankh. des Orients,' 138 ff; Fox, 'Med. Times and Gaz.,' 1867, Febr., 111.

⁷ Guiol, 'Arch. de méd. nav.,' 1882, Nov., 331; Deblenne, 'Essai de géogr. méd. de l'île Nossi-Bé,' Par., 1883, 232.

⁸ Chapin, 'Amer. Journ. of Med. Sc.,' 1837, May; Häolé, 'Sandwich Island Notes,' Lond., 1854, 430; Gulick, 'New York Journ. of Med.,' 1855, March; Duploux, 'Arch. de méd. nav.,' 1864, Decr., 486 (Sandwich Islands); Wilkes, 'Narrative of the U. S. Exploring Expedition,' Philad., 1845, ii, 124, iii, 330, iv, 285, v, 104 (Samoa, Tonga, and Fiji); Clavel, 'Arch. de méd. nav.,' 1884, Spt., 196 (Marquesas); Turner, 'Nineteen Years in Polynesia,' &c., Lond., 1861, 536 (Navigators' Islands); and 'Glasgow Med. Journ.,' 1870, Aug., 502 (Samoa); de Rochas, 'Topogr. méd. de la Nouvelle-Calédonie,' Par., 1860, 26; Bourguarel, 'Mém. de méd. milit.,' 1866, Avril, 338; Boyer, 'Arch. de méd. nav.,' 1878, Spt., 231; Charlopin, 'Notes méd. rec. en Calédonie,' Montp., 1868, 24 (New Caledonia).

⁹ Schmid, 'New York Med. Recorder,' 1869, Sptbr.; Maget, 'Arch. de méd. nav.,' 1877, Mai, 357.

¹⁰ Wilson, 'Med. Notes on China,' Lond., 1846, 23, 122; Friedel, 'Beiträge,' &c., Berl., 1863, 90, 132; Gordon, 'Indian Annals of Med. Sc.,' 1863, Apr., 422; Dudgeon, 'Glasgow Med. Journ.,' 1877, July, 331.

¹¹ Bernard, 'De l'influence du climat de la Cochinchine sur les malad. des Européens,' Montp., 1867, 50; Breton, 'Considér. sur la guérison de plaies chirurgicales et traumatiques chez les Annamites,' Par., 1876, 11; Beauvils, 'Arch. de méd. nav.,' 1882, Avril, 274.

¹² Heymann, 'Krankh. in den Tropenländern,' Würzb., 1855, 198; Epp, 'Schilderungen aus Holland.-Indien,' Heidelb., 1852, 162; v. Leent, 'Arch. de méd. nav.,' 1867, Oct., 249, 1872, Jan., 22, 1877, Febr., 81; Sollaud, ib., 1882, Spt., 167 (for Manilla).

¹³ Twining, 'Clin. Illustr. of the more important Diseases of Bengal,' 1835, ii, 432, for Bengal; Souty, 'Transact. méd.,' xi, 139, for the Coromandel Coast; Huillet, 'Arch. de méd. nav.,' 1868, Janv., 5, for Pondicherry; Voigt, 'Bibl. for-

As regards the morbid causes, it is well known that there is still profound obscurity in the chapter on chronic diseases of the skin; and the geographical inquiry does not aid the elucidation beyond providing us with a few general points of view. It serves to prove that many of the forms of disease in this group are, as regards their origin, causally related, either directly or indirectly, to influences of climate and bad hygiene: more especially to high temperature as an irritant of the skin, to national habits of dress, and to defective or mistaken care of the skin (raising the question of the anointing with oil as practised by many tribes), as well as to certain harmful articles of diet. On the other hand, in many other chronic diseases of the skin, it would appear to be a question of some specific cause; and that holds particularly for a number of cutaneous disorders endemic in low latitudes and often within narrow limits, which are probably parasitic in their nature, or may with good reason be guessed to be so.

§ 213. CIRCUMSTANCES OF PRICKLY HEAT.

Among the most universal and frequent of chronic skin diseases are the vesicular and pustular forms known under the names of *eczema*, *impetigo*, *ecthyma* and the like, being the various degrees of development of a simple inflammation of the skin, and arising either independently or in association with other cutaneous affections. Although they are equally domesticated in all parts of the world, they reach the maximum of frequency in the warm or hot zone, under the influence of, and in direct dependence upon the *high temperature* and the *greatly increased secretion of sweat due* to it.

Laugier, '1833, ii, 2, for Serampore; Young, 'Transact. of the Calcutta Med. Soc.,' ii, 334, for Aurangabad; Evans, ib., iv, 245, for Tirhoot; Cleveland, 'Madras Quart. Journ. of Med. Sc.,' 1863, Jan., 26, for the Malabar Coast; Day, ib., 1862, Jan. 24, for Cochin; ib., 1839, Jan., 74, for Singapore.

¹⁴ *Lowe*, ib., 1861, Jan., 8.

¹⁵ *Pent*, 'New York Med. Recorder,' 1868, June, 100.

Lichen tropicus.

This is the common name of a malady which is endemic not only in all tropical and subtropical countries,¹ but also in the warm climates of higher latitudes, as in *Sicily*² *Minorca*,³ and the southern part of the *Mississippi Valley*.⁴ It is known under various colloquial names, such as prickly heat, boubouilles, roode hond (Dutch), gale bédouine (in Algiers), ghamachi (in Bengal), hammem-nil or Nile-heat (in Egypt).

In its mildest form it is a simple erythema of the skin; in its further development small nodules appear on the reddened skin, which proceed to the next stage of vesicles filled with a clear watery fluid; when these dry up there is a slight amount of desquamation, and the affection is at an end. In particularly severe cases Beaufils has seen the eczematous rash go on to become vesicles filled with pus. The eruption provokes an exceedingly troublesome itching, which James Johnson⁵ describes from his own experience of it in the following graphic passage:

"The sensations arising from prickly heat are perfectly indescribable, being compounded of pricking, itching, tingling, and many other feel-

¹ Hille, in Casper's 'Wochenschr. für die ges. Hlkde.,' 1839, 601, for Surinam; Laure, 'Considér. prat. sur les maladies de la Guyane,' &c., Par., 1859, 72, for Cayenne; Heinemann, in 'Virchow's Archiv,' 1873, lviii, 184, for Vera Cruz; Lucas, 'La frégate à hélice la Victoire à Guaymas et à Mazatlan,' Par., 1868, 39, for the West Coast of Mexico; Borius, 'Arch. de méd. nav.,' 1882, Mai, 377, for Senegambia; Armand, 'Gaz. méd. de Paris,' 1863, 333, Feuille, and Paris, ib., 1866, 148, for Algiers, where it is chiefly the southern districts near the Sahara that are affected; Ehrenberg, in Hecker's 'Annal. der ges. Hlkde.,' 1827, vii, 13; Pruner, 'Krankh. des Orients,' 138; Friocourt, 'Arch. de méd. nav.,' 1884, Août, 90; and Rabitsch, 'Wien. med. Wochenschr.,' 1884, Nr. 49—51, for Egypt; Smart, 'Transact. of the Epidemiol. Soc.,' 1862, i, 226, for Hong Kong; Laure, 'Histoire méd. de la marine française,' &c., Par., 1864, 143; and Ollivier, 'Observ. faites en Algérie, Chine et Cochinchine,' &c., Strassb., 1864, 84, for Cochin China; v. der Burg, 'De Geneesheer in Nederlandsch Indie,' Batav., 1862, i, 276, for the Malay Archipelago; Polak, 'Wochenbl. zur Zeitschr. der Wiener Aerzte,' 1857, 723, for the southern provinces of Persia.

² Ziermann, 'Ueber die vorherrschenden Krankh. Siciliens,' Hannov., 1819, 210.

³ Cleghorn, 'Obs. on the Epidem. Diseases in Minorca,' Lond., German ed., Gotha, 1776, 218.

⁴ Drake, 'Treatise on the Principal Diseases of the Interior Valley of North America,' ii, 612.

⁵ 'The Influence of Tropical Climates,' Lond., 1815, p. 26.

ings, for which I have no appropriate appellation. Many a time have I been forced to spring from table and abandon the repast, which I had scarcely touched, to writhe about in the open air for a quarter of an hour; and often have I returned to the charge, with no better success against my ignoble opponent! The night affords no asylum. For some weeks after arriving in India, I seldom could obtain more than an hour's sleep at any one time, before I was compelled to quit my couch with no small precipitation, and if there were any water at hand to sluice it over me for the purpose of allaying the inexpressible irritation! But this was productive of temporary relief only; and what was worse, a more violent paroxysm frequently succeeded."

These extremely annoying sensations induce the sufferer to scratch himself, the consequence of which is that a traumatic element is added to the malady previously existing; in the place of the vesicles which had been ruptured small hæmorrhages appear, so that the affection acquires the look of so-called lichen agrius (Armand). The principal situations of it are the uncovered parts of the body, especially the fingers (upon which it often begins), the hands, the forearms, the neck and forehead, not so often the face. But it has been seen on other parts of the body, such as the arms, the chest, the back and the belly, very rarely the lower extremities. Sometimes the eruption comes out all at once, and in that case, if the patient be well treated, a cure will be effected not unfrequently in a few days or in a week. In other cases, however, there are frequent relapses; and under these circumstances the disease may last for weeks or months, especially if the patient be neglected, and may leave serious lesions of the skin behind it. Many persons, who have had the disease once, remain free from it in the future; but in others it returns season after season for a number of years under the influence of certain kinds of weather.

The proper time of the year for lichen tropicus is everywhere the *hot season*, and in the tropics the *rainy season* (Borius, Guiol, Voigt, Aubœuf, Falkenstein); the cases cease to occur as soon as the cool weather sets in. The influence of high *temperature* on the pathogenesis is further shown in the fact that the disease is not only rarer at elevated points within the tropics than on the plains, as in the Dutch East Indies, but also sooner over.¹

¹ Van der Burgh.

The majority of those who suffer from it in the equatorial and subtropical zone are *Europeans*, few of whom escape the malady, being for the most part attacked by it soon after their arrival. It is stated in the intelligence from most of the countries specially subject to it, that the natives enjoy an almost absolute immunity. Beaufile, however, says that cases of lichen tropicus are not altogether rare among the Anamese in Cochin China; also in the Dutch East Indies, according to v. d. Burg, creole children have it; and in the towns on the Pacific Coast of Mexico, as we learn from Lucas, the natives suffer more from it than newly arrived Europeans, for the reason that their skins become peculiarly sensitive to extremes of temperature from their practice of carefully wrapping themselves up during the cold season. In the warmer spots of the temperate zone, such as Minorca, the natives and acclimatised persons are as often attacked by lichen tropicus as strangers; and it is not difficult to understand why that should be so.

Intertrigo scrotalis navium.

§ 214. PECULIAR FORM OF PRURIGO IN THE RED SEA.

A skin disease closely allied to lichen tropicus in its symptoms, but essentially different from it in its etiology, has been described by Ehrenberg,¹ under the name of intertrigo scrotalis, as endemic on the Red Sea and along its shores. Pruner² also wrote upon it at a later date. The disease has sometimes the character of an erythema, as when the skin of the scrotum is its seat; sometimes the character of an eczema, as where the lower extremities are affected. Those two parts of the body are the only seats of the malady. It occurs mostly in the crews of ships navigating the Red Sea. Ehrenberg himself and nearly all his followers were attacked by it on the voyage, although the Arab sailors suffered less; it abated when they went ashore, but came back at once when they re-embarked. Pruner says that the

¹ L. c., p. 14.

² L. c., p. 140.

residents along the coast also suffer from it. It has been attempted to find the cause of it in washing with sea-water, the irritant action residing in the cryptogamic plants and infusoria contained in the water. Pruner considers that opinion baseless, inasmuch as he had seen the disease in persons who had never touched Red Sea water; on the other hand, Ehrenberg says that the effect was always bad when the ailing parts were wetted by sea-water, the condition becoming a good deal worse whenever he and his companions were obliged to wade up to the thighs in landing on the beach.

§ 215. ANALOGOUS FORM AT BUENOS AYRES ON BOARD SHIP.

Ehrenberg recalls a skin disease like it that he had heard of somewhere in America, but he is unable to give the precise locality. In Brunel's essay¹ on the diseases on board the French fleet during the blockade of Buenos Ayres, there is a description of a skin-disease that came under his notice, which would seem to be identical with the Red Sea form, and is probably the American form that Ehrenberg had in mind. Brunel gives the following account of it:

"Cette maladie s'est montrée sous la forme de vésicules légères, isolées, quelquefois rassemblées en groupes distincts faisant éprouver un sentiment de fourmillement. Au bout de 4 jours, ces vésicules se déchiraient, et laissaient écouler un liquide opaque et séreux qu'elles renfermaient; elles étaient ensuite remplacées par des croûtes jaunes, légères, qui séchaient promptement; quelquefois elles prolongeaient leur durée plusieurs mois, en se ravivant par des vésicules nouvelles. Ordinairement elles ne donnaient lieu à aucuns symptômes généraux: un sentiment de chaleur sur le lieu de l'éruption, un peu de soif, étaient ce qu'il y avait de plus apparent. Quelquefois elle était accompagnée d'un prurit assez vif, de malaise et d'agitation générale. Une inflammation vive, intense survenait, une douleur aiguë se faisait sentir, le tissu cellulaire des couches sousjacentes du derme s'irritait, ce qui déterminait une inflammation phlegmoneuse qui était accompagnée d'insomnie, de chaleur et d'un état fébrile. Alors les vaisseaux lymphatiques participaient à l'état inflammatoire, les glandes voisines se gonflaient, se tuméfaient, et ne tardaient point à devenir douloureuses.

¹ 'Observ. topogr. meteorologiques et médicales faites dans le Rio-de-la-Plata,' Paris, 1842, p. 51.

On voyait aussi survenir des symptômes d'irritation gastrique qui se dissipaient assez promptement par les bains généraux et un régime rafraichissant."

It mostly occurs, as Brunel says, on the skin of the scrotum, penis, lower part of the back, and thighs; more rarely on the shoulders, arms and the backs of the hands. It is oftenest seen in sailors and fishermen. In this case, also, the cause has been assigned to the irritant action of river-water or sea-water on the skin; also to the almost exclusive diet of fish among people of that class. Brunel himself lays the stress more upon the extreme variations of temperature in those regions—a view that he does nothing to establish, and for which there is not the slightest basis in fact.

Acne, Boils, Carbuncle.

§ 216. GENERAL FACTS OF THEIR DISTRIBUTION.

The inflammatory infiltrations of the follicles of the skin known under these names connect with the skin-diseases already treated of both as regards frequency, and in part also, in respect to origin. They have a two-fold interest for inquiry: firstly, because they are common enough both in the highest arctic latitudes and in the equatorial and subtropical, to deserve, like the eczematous and impetiginous forms, the name of *endemic*; and secondly, because they break out from time to time in all parts of the world in *epidemics*, sometimes even in far-reaching epidemics.

In nearly all the medical writings on lichen tropicus above quoted, mention is made of boils co-existing with it, or occurring under the same climatic conditions, and of their being an unusually common trouble of Europeans, especially those newly arrived. "Les furoncles," says Huillet for Pondicherry, "font le désespoir des malades et des médecins." But among the natives also of those regions, they are often seen along with eczematous and impetiginous skin-diseases; and the same is true of the arctic peoples. An explanation of the fact is readily found in the absolute want of cleanliness—in the "overordelige svineri," as it is called in the

official report for Greenland, a country where it is quite the exception to wash the body—and in the continual irritation which the skin receives from the dirt collected upon it and on the clothing, leading to that stopping up of the sebaceous glands which is characteristic of acne and boils. Doubtless these things are helped by the practice in use among many coloured and other races but little touched by civilisation, of anointing the body with rancid oil or fat ; possibly also by the great development and activity of the sebaceous glands in the dark races and particularly in the negroes, a development which accounts for the unpleasant odour that even the cleanest of negroes diffuse around them.

§ 217. EPIDEMICS OF BOILS, WHITLOW, &C., IN ASSOCIATION WITH CARBUNCLE.

The occurrence of *boils in the form of an epidemic* is an interesting phenomenon that has attracted little notice hitherto. From the last century we have a few epidemiographical notices of that kind, including one for a market village of the Hungarian county of Borsod¹ in 1780. In later years, as Frank² tells us, there were several notices of epidemics of boils communicated to the medical society of Wilna ; there is also a reference to their epidemic prevalence in 1834 and 1835 among the soldiers of a regiment of the line in the arrondissement of Mauléon (Basses-Pyrénées).³ But it was from 1849 to 1853 that special interest was aroused by an epidemic that broke out almost at the same time in various parts of the world, and became very widely diffused in some of them : including the Eastern littoral of the United States (New England, New York, Philadelphia), the Mississippi Valley⁴ and the West Indies (particulars by Bowerbank⁵ for Spanish Town, Jamaica). There are also notices of the disease in those years from England,⁶ where

¹ Benkoč, 'Ephemer. meteorol.-med.,' &c., Vindob., 1794, i. 53.

² 'Præceps med. univ. præcepta,' 1, vol. i. sect. ii. Lips., 1826, 482.

³ Martin, 'Mém. de méd. milit.,' 1844, tom. lvii, 147.

⁴ Drake, 'Treatise,' ii, 767.

⁵ 'New York Journ. of Med.,' 1853, May, 397.

⁶ Laycock, 'Lond. Med. Gaz.,' 1851, xii, 417 ; Forster, 'Lancet,' 1851, May,

it appeared almost at the same moment in London, Oxford, Cambridge, Bath, Bristol, Manchester, Somerset, Taunton, the Kentish and Hampshire coasts, the Isle of Wight and North and South Wales, being so general that, as soon as it showed itself in a house or in a self-contained institution, the most of the inmates, or at least a considerable part of them, became affected by it. We hear of it also in Italy (Bosco Eliseo, Voghera and other places in the district of Ferrara)¹ and in Palma (Majorca).² According to Hunt it was epidemic at the same time in Ireland and Scotland, France, the Cape and India. A few years after there was an epidemic of boils in Sweden (1855-59), so generally diffused that hardly any part of the country remained free from it.³ From the Dutch East Indies there is a notice of an epidemic at various places, including Singkel in Sumatra.⁴

Connected with the rise of furuncular disease to an epidemic is the very considerable coincident increase in the number of cases of *carbuncle*. Of that fact we have a striking proof in the English tables of mortality at the time of the epidemics above mentioned. Whereas the deaths from carbuncle in London averaged 3.5 annually from 1840 to 1847, and were 8 annually from 1844 to 1847, they rose in 1848-1851 to a yearly average of 18, and, in the years 1852 and 1853, the years when the epidemic of boils was at its height, they reached the considerable figures of 50 and 70.

There is another phenomenon connected in all probability with the epidemics of boils, namely the occurrence of cases of *whitlow* in groups, after the fashion of an epidemic. After remarking that "plus vice societati medicæ Vilenſi de furunculis epidemicæ grassantibus quaestio erat," Frank adds: "memoratu dignum est, et panaritîa simul regnasse."

Martin observes, in connexion with the above-mentioned

479; Hunt, *ib.*, 1852, Aug., 149, 190, Sept., 236; Kinglake, 'Edinb. Monthly Journ. of Med., 1852, July, 18.

¹ 'Relazione sul cholera-morbus che domino nella città e provincia di Ferrara nel 1852, p. 27.

² 1853, 237.

Berättelse år 1856, 87, 1857, 125, 1858,

⁴ 249.

epidemic among the troops in the arrondissement of Mauléon in 1834 and 1835, that there were, besides the boils, many cases of carbuncles and abscesses in the subcutaneous tissue, and that whitlows were particularly common. The same correlation came out in a very marked manner during the last epidemics in the United States,¹ England,² and Sweden.

There has been complete obscurity hitherto as to the external conditions that give rise to these epidemic outbreaks of boils. The disease in that form has been equally prevalent in the hot and cold zones and in temperate climates, at all seasons, in warm and cold weather and in wet and dry, among all classes of people and along with every kind of nutrition and mode of life. Drake and others have called attention to the coincidence of epidemic erysipelas; others, like Kinglake, have dwelt upon the fact that an epidemic of scarlet fever had preceded the epidemic of boils; and a number of writers, especially in the tropics, have pointed out that boils became epidemic at a time when "an exanthematic genius epidemicus" was rampant, a phrase that really explains nothing.

Prurigo.

§ 218. AN EGYPTIAN FORM IN THE NEGRO.

Prurigo, it is well known, is a disease very often met with especially among the poor. Of its *endemic prevalence* we have an account by Pruner³ relating to *Egypt*, and another by Allan⁴ for the *Seychelles*.

Pruner's statement, which applies only to negroes in Egypt, is as follows:

"There first appear, on the outer side of the upper arm or forearm, and almost as often on the outer side of the thigh or leg, a few papules far apart and hardly noticeable. From being scratched they become

¹ Drake, l. c.; Morgan, 'Amer. Journ. of Med. Sc.,' 1852, Jan., p. 144.

² Hunt, l. c.

³ L. c., p. 143.

⁴ 'Edin. Monthly Journal of Med.,' 1841, Aug., p. 570.

obvious as dark scabbed points with blood underneath, and between them are white tracts or bands made by the scratching, and consisting of abraded epidermis and a white powder which looks crystalline under the microscope. Where the skin is wrinkled, as in the palms of the hands, the crevices are full of this powder. Usually it is the forearm that suffers most. If the condition lasts long, the outer side of the limb gets covered with pustules, crusts and chaps, from eczema, or even itch, being superinduced. Long after it has healed, the skin remains in a shining, scar-like state, but with no loss of the pigment."

To this description Pruner adds the remark that the disease, which the Arabs call "aesch-el-Medinah," often attacks the negroes when they are on the way to Egypt from their native countries, or, at all events, very soon after their arrival; and that two things seem to contribute materially to the production of the malady: first, neglecting to anoint their bodies with grease, according to their practice in their homes; and, second, the peculiarly irritating dust of Egypt, which would be all the more injurious where cleanliness was absent.

In his account of the disease in the Seychelles, Allan says: "Nearly every European suffers from a mild prurigo during the first six or twelve months of his residence; the natives look upon it as incurable, and as an endemic malady. It is different from lichen tropicus in its situation, affecting the legs from the knee downwards, including the feet, and causing most annoyance on the soles of the feet and on the sides of the toes." He says nothing of its cause.

Psoriasis.

§ 219. SOME TROPICAL VARIETIES, PROBABLY EPIPHYTIC.

Psoriasis is one of the most universal of skin-diseases, being found in every climate and zone and among all races. It would appear to be more than ordinarily common in equatorial and subtropical latitudes, and most of all among the *coloured races*. That is the conclusion that we come to from

the medical records of the *West Coast of Africa*,¹ *Senegambia*,² *Egypt*,³ *Abyssinia*,⁴ the *Zanzibar Coast*,⁵ *India*,⁶ *Ohina*,⁷ *Polynesia*,⁸ the *West Indies*,⁹ *Guiana*,¹⁰ *Brazil*¹¹ and *Peru*.¹² It is hardly probable, according to the experience of other places, that circumstances of climate, or defective care of the skin, or other harmful and unhygienic things have any real influence in the pathogenesis.

It is a likely conjecture that, in many of the countries just named, the disease may be of an epiphytic nature, particularly where it is found of a type somewhat divergent from the usual form, or where it has special colloquial names, like the "daud" of the natives in Gauhati (Assam), or the "curuba" of the Indians in Brazil. But, so far as I know, there have been no inquiries into the matter hitherto.

Urticaria.

§ 220. A PERSIAN FORM DUE TO STING OF AN INSECT ; OFTEN DUE TO TOXIC THINGS EATEN.

Among the usual causes of urticaria, external irritants of the skin and the eating of certain substances (urticaria ab ingestis) are well known to play no inconsiderable part. If it extend under the influence of one or other of these etiological factors to a large part of the population of a locality, the disease assumes the character of an endemic. With reference to external irritants, Polak gives the following interesting fact from *Persia* (l. c. p. 740) :

¹ Férus, Michell, li. cc.

² Chassaniol.

³ Fox, Pruner.

⁴ Courbon, l. c., 33.

⁵ Burton.

⁶ Macpherson, 'Lond. Med. Gaz.' 1841, ii, 546; Leslie, 'Transact. of the Calcutta Med. Soc., vi, 61; Twining, 'Clinical Illustrations,' ii, 432.

⁷ Diver, 'Medical Intelligencer,' 1842, March 9; Friedel, 'Krankh. Ostasien,' 90, 132; Dudgeon, l. c.

⁸ de Rochas, l. c., 26; Wilkes, l. c.

⁹ Savarésy, l. c., 80.

¹⁰ Pop, 'Nederl. Tijdschr. voor Geneesk,' iii, 213.

¹¹ Martius in Buchner's 'Repertorium für Pharm'

¹² Smith, 'Edin. Med. and Surg. Journ.,' 1840,

"The malady, which is known here by the names of "nabot-el-leyl" (night plant) and "ihr" is an extremely depressing affection in summer, especially for new-comers. The cause of it is a small sand-midge or sand-fly of the colour of the ground, whose sting produces blebs of urticaria not merely at the place of puncture, but at other points of the skin in contiguity to it. It is not every stranger who has this disposition; for, of all the newly arrived Austrian contingent, the only ones who suffered from urticaria were the wife of Captain K— and myself; in our cases the itching was unbearable, and the limbs quite covered with crusts of blood. After residing some time in the country we both got rid of it. As I have never seen acute urticaria to that extent in winter, I am inclined to attribute it to the sting of the small insect, the more so that the covered parts of the body, such as the chest and abdomen, were very rarely affected. Another interesting point is that new arrivals were not troubled by that unbearable kind of nettle-rash except in the first year; in subsequent seasons a bleb did indeed arise at the site of the sting, but it did not propagate itself by continuity."

The second order of endemic influences consists mostly of certain species of fish, crabs and mussels. Drake mentions that urticaria is exceedingly common on the shores of the *Gulf of Mexico*, and other parts of the littoral of North America, as a result of eating shell-fish, crabs, lobsters and the like; and this is confirmed by Ruz, who says that the prevalence of the disease in the *West Indies* is for the most part due to the eating either of certain poisonous species of fish, or of various kinds of preserved meat, which are much in use among the colonists. Along with that we may place a statement by Fox, to the effect that urticaria is very common in *Egypt* among persons who make long journeys into the interior and take with them preserved fish as part of their provisions. In the *islands of Oceania* also, the eating of certain crustaceans is given as the cause of the urticaria that is very often seen in that part of the world.¹ In like manner Bogorodsky thinks that the prevalence of the malady in *Kamschatka* ought to be attributed to the eating of certain poisonous crabs and mussels which are found there. Our information does not enable us to say whether racial differences have anything to do with the occurrence or the frequency of the disease; but Pruner states that he has never seen urticaria among the coloured races in Egypt.

¹ Clavel, l. c., p. 196.

Ichthyosis.

§ 221. ENDEMIC IN EAST INDIAN AND PACIFIC ISLANDS.

From a number of tropical countries, such as the coast of *Senegambia*,¹ *Borneo*,² the *Moluccas*,³ the *Marquesas*,⁴ *Wallis Island*⁵ (Samoa), *Guayaquil*⁶ and the coast of *Peru*,⁷ we have accounts which indicate that ichthyosis is endemic, although they tell us nothing of the nature and causes of the disease. It is a very likely guess that in some, at least, of these endemics, we have to do with a *parasitic* process. That suggestion arises particularly out of Heymann's account of the ichthyosis on a few of the islands in the Malay Archipelago; it reminds us of the description given of *cascaôe* by Pompe von Meerdervoort (see vol. ii of this work, p. 377), which is in all probability a peculiar form of herpes tonsurans or ringworm. There seems to be little likelihood in Clavel's idea that the malady in the Marquesas is due to the use of kava-kava, an aromatic liquor made from the stalks and root of *Piper methysticum*; for that beverage is in somewhat general use in Polynesia, without giving rise to ichthyosis everywhere. Another explanation of its endemicity, apart from parasitism, may perhaps be found in the fact that it is notoriously a hereditary disease; it is intelligible, therefore, that it might extend in that way through small circles of people and become domesticated among them.

¹ Chassaniol.² v. Leent, 'Arch. de méd. nav.,' 1872, Janv., 22.³ Heymann, l. c., 203.⁴ Clavel, l. c.; ref. in 'Arch. de méd. nav.,' 1865, Oct., 292.⁵ Raynaud, ib., 1876, Août.⁶ Duploux, ib., 1864, Oct., 283.⁷ Tschudi, l. c., 471; Smith, l. c., 338.

Lupus serpiginosus.

§ 222. A CHINESE FORM.

In China, a chief centre of the chronic dermatoses, and more particularly at Tien-Tsin, a city peculiarly rich in them, a skin disease has been observed by Gordon¹ which was new to him, but would connect, according to his description of it, with lupus serpiginosus. It differs from the ordinary form of that disease in being strictly confined to the cutis, or in having no extension of the process to the underlying tissues. Friedel,² who also refers to it, observes that the destruction of the skin proceeds in zig-zag lines from a few centres, and that the cicatrisation in like manner follows the order from centre to periphery. The scarring is accompanied by extreme contraction of the adjoining parts; so much so that, if the malady have its seat in the face or the neck, "the appearance given to the features of the sufferer," as Gordon says, "is absolutely hideous."

¹ 'Indian Annals of Med. Sc.,' 1863, April, p. 422.

² 'Beiträge,' &c., p. 62.

CHAPTER XXIII.

ORIENTAL BOILS AND OTHER SORES.

§ 223. FIRST ACCOUNTS OF ALEPPO BOIL.

One of the most interesting of the dermatoses, endemic at a number of tropical and subtropical places, is a special kind of boil called by the French "bouton," or "clou."¹ The first accounts of this remarkable disease belong to the latter part of the eighteenth century; they come from Aleppo, where Russell,² Hasselquist,³ Holland⁴ and Volney,⁵ found it to be endemic and gave some slight account of it under the name of the Aleppo boil. Attention was first directed to it more generally by the writings of Alibert,⁶ Disant and Requin, who gave an account of it from information supplied by the French Consul at Aleppo; but most of all by the work of Guilhou, who accompanied Pariset on his scientific journey to the Levant, and published the results of his systematic inquiries on the boil-disease in an interesting memoir. The opinion was long held that the malady was one peculiar to Syria and specially to Aleppo; but it was

¹ The popular names of these boils are derived sometimes from the locality, as in the case of the Aleppo, Delhi, Mooltan and Biscara boils; or from the period of their duration (about one year), as in the Arabic name khab-el-seneh, the Persian salek, the Turkish tschiban, and the Russian godownik; or from the assumed cause, as the "date disease" (bess-el-temeur in Arabic, and dous-el-kourmati in Turkish). In Delhi the disease is called Aurungzebe, after the prince who reigned there in the eighteenth century, and is said to have died of the boil.

² 'Natural History of Aleppo, &c.,' Lond., 1756, 262.

³ 'Reise nach Palästina,' Rost, 1762, 593; and 'Abhandl. der Schwed. Akademie,' xii, 139.

⁴ 'Histoire de la Soc. roy. de méd.,' 1780, ii, 314.

⁵ Volney, 'Voyage en Syrie et en Egypte,' Par., 1787, ii, 130.

⁶ An alphabetical list of all the authorities quoted is given at the end of the text.

afterwards proved that the disease was indigenous in other parts of Asia Minor, as well as in Central Asia, in India, at a few points in the southern peninsulas of Europe, and in the African states bordering the Mediterranean; although in those countries it was mostly limited to a single spot or to a small district. It was thus shown to have a considerable range within the tropical and subtropical zones of the Eastern Hemisphere, from 23° to 45° N. and from 15° W. to 20° E. It does not appear to be known at all in the Western Hemisphere.

§ 224. COUNTRIES WHERE THE BOIL IS NOW KNOWN.

Proceeding in that distribution-area from west to east, we come first¹ upon a considerable focus of the disease on the banks of the Muluia in *Morocco*,² in numerous oases of the *Algerian*³ desert (Tlemcen, Onaregla in Oran, Laghouat in Alger, Biscara, Tuggurt, and Liban in Constantine), and in the *Tunisian Sahara*.⁴ From Tripolis we have as yet no trustworthy information about it; but in *Egypt* cases have been seen at Suez and Cairo.⁵ On European soil, the island of *Crete* is one of its endemic centres;⁶ also at Eupatoria in the *Crimea*, Libert has seen the malady among Tartars, as well as in a family of gipsies at Perikop. Coming to the countries of Nearer Asia, we hear of it in *Cyprus*,⁷ and at a few places in *Asia Minor*,⁸ such as Broussa at the foot of the

¹ Collin ('Contribution à la géogr. méd. du Haut-Sénégal,' Paris, 1883, p. 48) tells us that he was himself the subject of this disease in Senegambia. His account of the clinical history corresponds exactly with the type of the Biscara or Aleppo boil; but I cannot find a single word about the malady in any other of the exceedingly numerous medical writings from that region. His case is therefore highly remarkable; and one is warranted in entertaining the modest doubt whether he had not contracted the malady somewhere else.

² Cabasse, Bédiéh, Paynter.

³ See the papers by Poggioli, Bédiéh, Quesnay, Verdalle, Guyon, Massip, Beylot, Armand, L. and A. Bertherand, Weis, Netter, Manon, Sourier, Manoha, Hamel, Didelot, Castaing, Paynter, Alix, Gailleton, Seriziat, Hillairet, Weber, Barth, Lavéran, Brocq, Constans.

⁴ Duclaux (ii reference), Depéret.

⁵ Pruner.

⁶ Carter (quoted by Fox), Zachariadis.

⁷ Pruner.

⁸ Rigler, West.

Mysian Olympus. In the same part of the world, we find that one region of *Syria*, and the great plain corresponding to the ancient *Mesopotamia*,¹ form very important centres of it. In the former it occurs chiefly in the northern districts of the basin of the Orontes between Killis and Aleppo; whereas it would appear to be only occasional in the towns and villages to the west of Aleppo, such as Skanderoon, and those of the Lebanon, and altogether unknown among the bedouins and the population of the Kurdish Highlands. In Mesopotamia its area includes the whole plain between the Euphrates and the Tigris, from Diarbekir downwards through Orfu, Mosul and Bagdad as far as Bassora. Joining on to that is a not less inconsiderable area of the disease in *Persia*,² where its headquarters are the central regions of Teheran, Kashan and Ispahan, while there is less of it in Hamadan; in the northern mountainous districts, as well as on the shores of the Caspian, it is quite unknown. Across the Persian frontier we find a small focus of it in the district of Elisabethpol belonging to the government of *Tiflis*.³

From Central Asia I know of only one reference to the boil, namely, that it occurs in Tashkend and along the river Tchirtchik, where it bears the name of "sarten;"⁴ but it is not improbable that it is indigenous in other parts of *Turk-estan*, as well as in *Afghanistan* and *Beluchistan*, from which countries we hear hardly anything about disease at all. That conjecture is all the more warranted, for Afghanistan at least, because one of the most important endemic areas of the boil is in Indian territory close to the Afghan frontier,⁵ extending along the Indus from the Punjaub (Lahore, Mooltan) southwards through Sind, (it would even seem as far as Gujerat and the Gulf of Cambay), and eastwards through Rajpootana and the North-West Provinces as far as Delhi.

¹ See the papers by Katiennae, Driant, Guilhou, Griffiths, Floyd, Rafalowitz, Jilt, Zimpel, Gröschel, Guys, Eder, Willemin, Ponty, Evatt, Wortabet, Schlimmer, Thilo.

² Polak, *Thulesan*.

³ Heintze, Polak (1868), Liebau.

⁴ *Tschirchik*, Helman.

⁵ Wilson, Halfour, Fraser, Chevers, Fleming, Dickinson, Harley, Fayer, Fox, Lewis and Cunnah

Meerut, Lucknow, and Gwalior. Bengal proper, Madras, Central India, and the Bombay Presidency (excepting the places named) appear to be quite free from the malady. Nor am I acquainted with any writings from which we might infer its existence in the East Indies,¹ in Lower India, in China or in Polynesia.

§ 225. SKETCH OF THE SYMPTOMS AND MORBID ANATOMY.

There are many discrepancies in the accounts given by observers of the type and clinical history of the boil; but there is a good deal of uniformity in the main lines of their picture of it, which may be sketched somewhat as follows:

Clinical and anatomical characters.—Without any symptoms premonitory of a constitutional disease, the boil begins as a reddish spot on the skin, with a very slight degree of nodular thickening at first, and gradually attains the size of a pea or a bean; a zone of redness surrounds it, and there is much itching. After the boil has lasted some time, it may be several months, there begins to ooze from its surface a clear serous fluid, which dries to a crust; the latter is often of considerable thickness, adheres firmly to the skin, and is soon replaced if it should have been forcibly detached. The substance of the nodule gradually falls into purulent disintegration; so that there develops underneath the crust a round ulcer from 2 to 5 centimetres ($\frac{3}{4}$ to 2 in.) in diameter. The edges of the ulcer are irregular and as if eaten out; the process often goes deep down among the cutaneous tissues; the floor is uneven or lumpy, with greyish wart-like excrescences springing from it, which often dissolve to grow afresh, and yield an intensely offensive pus, mostly of thin consistence; the pus spreads over the surface of the sore and hardens to a dense, firm, dark-coloured crust. Around the ulcer the skin is red; sometimes erysipelas develops, or lymphangitis, with inflammatory swelling of lymphatic glands. When the suppurating process has gone on for several weeks or months, the floor of the ulcer at length begins to show good granulations capped by whitish crusts; these gradually fill up the defect of substance, and in due time cicatrization is complete. The cicatrix, following the shape and depth of the ulcer, is of irregular circular form, either level with the skin or depressed, often pigmented or discoloured a uniform brown; it puckers towards a central point, like the scar left after a bad burn.

¹ If the boil is on the face, disfigurements of the nose, cheek,

Not unfrequently several boils develop,

¹ under the name of Amboina boil or
yaws. See Vol. II, 101.

which coalesce in the end, if they had been close together, leaving elongated or irregularly shaped sores and eventually corresponding disfigurements.

The affection is met with in all parts of the body; but most often in the face, particularly on the cheek, or at the angle of the mouth or of the orbit, or on the wing of the nose; it is rarer on the upper eyelid or on the forehead, and never seen on the hairy parts of the head; on the upper or lower extremities it does occur, but mostly in strangers, its seats being the dorsal surface of the hand or foot or the neighbourhood of a joint; it is extremely rare on the trunk or the sexual parts (Guilhon, Poggioli, Pruner). In the majority of cases there is only one boil, but it is not rare for two, four, or eight to develop; and in a few cases from twenty to fifty have been counted in one subject, some of them being on the face and the rest on other parts of the body. There is never any constitutional disturbance noticed in the course of the disease, such as could be traced to a connexion with it. But for the disfigurement of the face through contraction of the scar,¹ in cases where that region had been the seat of the boil, the disease leaves no ill-effects in the body. It has just as little influence in modifying a pre-existing malady as it has on the type of an intercurrent one. It is only in the case of scrofulous, scorbutic, or syphilitic persons that the ulcer assumes a malignant character, as we learn from Pruner, Polak and some other observers.

The duration of the disease varies from six or eight months to a year or more (hence the popular name of "twelve-month boil," in Persia, Mesopotamia and Syria); the longer duration is mostly when successive new boils occur in the neighbourhood of disintegrating nodules. The belief, at one time held somewhat generally, that a person never had the disease more than once, is not founded on fact, although it is true that a recurrence of the boil is exceptional; Willemin has seen a second attack in a few individuals who had resided at more than one centre of the disease.

The *anatomical nature* of the boil has not been examined into at all closely until recent years; but all observers who have paid any attention to the subject are agreed that the type is that of the so-called granulation-tumour or granuloma. The only difference of opinion is that, while some inquirers, such as Lewis and Cunningham, take the malady to be a sort of lupus,² others see in it a specific granulation-

¹ It happens rarely that a piece of the wing of the nose or of the eyelid is destroyed by the process; conjunctivitis, however, is a frequent result of the irritation. In Ispahan, where nearly all the inhabitants have had the malady, a proverb is in use which refers to the disfigurement of countenance: "Look at only one side of an Ispahan woman's face."

² "The pathological changes," they say (l. c., p. 53), "which we found to have occurred in the corium and in the rete mucosum correspond very accurately with what Virchow has described as characteristic of lupus in his classical work on 'Diseased Tumours' (ii, 485). Had Professor Virchow's description been fol-

tumour, which most of them would trace to the presence of some peculiar parasite. We shall return to that point.

§ 226. FACTORS IN THE CAUSATION; ALLEGED INFLUENCE OF DRINKING-WATER.

So long as we have no perfectly trustworthy information from temperate latitudes concerning the occurrence of a form of boil-disease completely identical with that which is here described, it will be impossible to avoid the impression that the geographical area of the disease is in some way dependent on *climatic influence*. That supposition finds a good deal of support in the fact that the outbreak of the boil stands in a tolerably decided, if not an invariable, relationship to influences of *season*. Nearly all the accounts that reach us from the most various points of its distribution-area, allege that it begins for the most part in late summer or in autumn, being the months of September, October or November in subtropical countries¹ and the first part of the cold season in the tropics.² We shall afterwards see what interpretation is to be put upon that influence of season in the pathogenesis.

Circumstances of locality, such as the *nature of the ground*, have no kind of significance for the occurrence of the boil. It has been found equally on dry soil and wet, rocky and sandy, and in high and low situations. No doubt one or two French and English writers, such as Bertherand and Dickinson, have laid a good deal of stress on malarial soil in this connexion; their views, however, are not based upon facts, but spring from the fanaticism about malaria which is still rampant in many quarters.

It is just as difficult to show that the endemic seats of the boil are in the slightest degree dependent upon *unhygienic influences* of whatever kind. In its native foci it occurs to the same extent among poor and rich, among the proletariat

lished as one referring to specimens of the Oriental sore as seen at Delhi, we testimony to its surprising correctness."

Poynter, Weber, Laveran; for Aleppo:

as well as in the highest circles of society, among all vocations, and in the army as much among the officers as the men. In like manner the belief, widely spread among the Moorish and Arab population of Algiers, that it is due to the unstinted use of dates (whence the local name of "date-disease"), is nothing but superstition. The one thing among exterior influences of that sort which has always arrested the attention of observers and is debated with peculiar keenness at the present day, is the domestic *water supply*, a possible cause of the disease that cannot be set aside without further consideration.

The very earliest writers upon the disease in Syria, namely, Hasselquist, Russell and Volney, had stated that it was a prevalent belief among the inhabitants of Aleppo that water from the brook Coik had the power to cause the malady. This belief was adopted by Guilhou and Jölt, as well as by Willemin, who relied chiefly on the fact that the area of the disease round Aleppo extended just as far as the water of that stream was used for culinary purposes, whereas the boil did not occur in any of the neighbouring villages which were served by water from another source. Wortabet also took up that opinion, failing any other causation that could be proved. In Algiers, too, the popular belief has placed the cause of the disease in the drinking-water, and a number of French medical writers, such as Poggioli, Massip, Weiss, Netter, Manoha and Arnould, have pronounced in favour of the theory. But it is in India that it has found its best support, at the hands of Frazer, Alcock, Candy and others, and more especially of Lewis and Cunningham, who have given particular attention to the question and made it the subject of a thorough-going inquiry. In Delhi, as we learn from them, the boil has been endemic from time immemorial; but down to 1857 the British troops escaped it, having been quartered in cantonments a few miles from the city. In that year, being the year of the Mutiny, the city was taken by the British and a garrison established in it; the boil soon made its appearance among them, and became so prevalent in the following years down to 1864 as to excite serious attention. The supposition that bad water might have caused it led the military authorities to provide a better

supply for the use of the British troops; since that time the disease has declined among them, although the same abatement has not been noticed among the sepoys.

As to the substance in the water, which imparts to it its injurious or morbid properties, the opinions vary in the different centres of observation. In the brook Coik at Aleppo, it is the large amount of gypsum, according to Jölt. In the Punjaub, according to Frazer and Candy, it is the abundance of nitrates, while Alcock would blame the presence of sulphuretted hydrogen due to putrefying matters; Lewis and Cunningham, who express themselves very cautiously, adduce the high degree of hardness of the suspected water, that is to say, the considerable amount of lime and magnesia in it, although they take care to add that they do not consider the amount of these salts to be the real cause of the disease, but merely an index of the noxious property of the water. In Algiers, some of the French medical authorities lay a good deal of stress on the amount of chloride of sodium in the water, while others of them attach importance to the quantity of earthy salts.

As regards the statements of Lewis and Cunningham concerning the abatement of the disease among the British troops in Delhi since their drinking-water was improved, it is not clear from the figures given by them that any such abatement has really taken place: the statistics have a source of fallacy in them, inasmuch as they include not only cases of the boil, but of abscesses as well; further, there are no considerable differences discoverable, for each year of the period, between the British and native troops in respect to abatement of the disease; and finally, the question remains whether fluctuations in the amount of the disease from year to year may not be explained on other grounds than the change in the water-supply. As illustrating the last point, Tholozan calls attention to the fact that in Teheran they have had periods of considerable increase and substantial remission of the disease, or important fluctuations in its endemic prevalence: thus, in 1858-60, the disease was but rare, while in 1861-63 it showed itself in very considerable diffusion. Tholozan himself is emphatic that no sort of causal connexion between the disease and the drinking-

water exists ; and at all events we shall have to find some other explanation of these variations in the number of cases, than a change from one water-supply to another.

Against this drinking-water theory, as it may be called for shortness, many other weighty objections have been raised by those who have studied the disease. Laveran says that the water of Oued-Kantara, in the oasis of Biscara, is undoubtedly very rich in lime salts ; but it is now used almost exclusively for irrigation, while the water used almost universally for drinking is that which is collected in cisterns and contains only 0·794 of solids in 1000 gr. ; yet the boil continues to be a disease of Biscara just as before. Again, El Kantara and other oases of the Algerian desert, where good drinking-water is found, are endemic centres of the malady. Lastly, we have to keep in mind a fact pointed out by Weber, that persons have been attacked by the boil a few days after arriving in Biscara, who had drank nothing but aerated waters.

From other countries we have evidence that persons who had lived a long time in centres of the disease and had abstained altogether from using the suspected water, had not escaped the boil. Thus Rigler relates that he knew a family who had come in 1850 from Aleppo to Constantinople, all the children of which bore the scars of the boil, although they had got only rain-water or cistern-water to drink, according to the mother's assurance. Schlimmer also says he never drank water that had not been boiled, and yet he was attacked by the disease. Another thing against the theory is that neighbouring villages, standing on the same river and all getting their water-supply alike from it, are some of them subject to the disease and some of them quite free from it. Finally, if the water-theory were right, we should be totally unable to explain why the boil had certain seats of election in the body, nearly always the face, sometimes the extremities, and hardly ever the trunk ; and why it is that innumerable places all over the world have a water-supply rich in mineral constituents of various kinds, but not a trace of the boil-disease.

A more likely view, although one that is not free from objections and is meanwhile unproved, has been put forward

by Anglo-Indian authorities, first by Smith, so far as I know, and afterwards by Gaskoin,¹ Murray and others, to the effect that the disease is connected with the domestic water by reason of the latter containing some specific or parasitic noxious thing which enters the skin when the water is used for washing with, and in that way excites the disease. I shall recur to that doctrine in the sequel.

§ 227. AGE OF CHILDHOOD PREDISPOSED ; OTHER PREFERENCES.

As regards the *predisposition of individuals* to acquire the boil, nowhere do we find any differences between the two *sexes*, or between various *ages*, *races* and *nationalities*. Among the native population in the centres of the malady, it occurs oftenest in childhood (rarely before the second or third year) ; but it is not altogether rare in persons of from forty to fifty years, who had thought themselves secure against it (Disant, Tholozan). Usually strangers are not affected by it until they have been from two to four months in the place ; but in some instances they acquire it after two or three weeks or even after a few days, and in other instances not until several years have elapsed. A very remarkable fact, vouched for by trustworthy observers,² is that foreign residents who had spent some time in a locality subject to the boil and had left it in good health, have had the disease break out in them after their return home. There may have been errors of diagnosis, no doubt, in some of these cases ; but it is impossible to deny the fact altogether.

Castaing says that, in his Algerian experience, the white race is attacked more often than the coloured, and that he had seen only two cases among 400 negroes ; but I have not found any confirmation of that, either in the writings from Algiers or in those from other countries.

¹ ' Brit. Med. Journ.,' 1876, Feb., p. 192.

² Willemin, Burge, Alcock.

§ 228. THE PARASITIC DOCTRINE APPLIED HERE; COMMUNICABILITY.

Inquiring into the *causes of the boil*, we are met on the threshold by two facts, which have been adverted to several times already: (1) The disease is spread over wide tracts of country, but within these it is confined to particular spots by the most rigid lines, the surrounding neighbourhood being absolutely free from it. A striking instance was that of the English troops at Delhi, who acquired the disease after they took possession of the city, although they had been entirely exempt from it while they occupied the cantonments in its vicinity. (2) Within the various foci of the disease, it prevails very generally among the population, so much so that those who escape it are the minority. In Aleppo and other places, a child seldom reaches its seventh year without having had the boil.

From these facts we may safely conclude that the actual cause of the malady is a thoroughly local one, and that it must be very widely diffused within those limits; accordingly it cannot be assigned to the soil or to the climate or to unhygienic influences, which the affected places share in common with places not affected; and we are therefore driven to assume a quite *specific* cause, which may indeed depend for its development or its existence upon circumstances of season, weather or soil. From these considerations it will be seen that the distinctive natural history of the disease lends its support to the doctrine that had already been put forward conjecturally by Virchow, that *the boil is a parasitic malady*.

The first precise inquiries in that direction were made by Fleming and Smith; but the positive conclusions that they came to¹ were so obviously stamped with the mark of fallacy,

¹ In the morbid tissues Fleming found small corpuscles, with a highly refractive outer membrane, which he took for the eggs of a parasite—an interpretation that he abandoned subsequently, without advancing any other definite opinion of their nature. Smith found, in the pus from a boil, cells of various size and form, and of a variety of colours, which he thought himself warranted in explaining as the eggs or larvæ of a species of distoma, inasmuch as he had found a distoma-like parasite in the diseased tissue itself.

that no one gave any heed to them. Vandyke Carter's conclusions, also, from an examination of some specimens of the morbid growth sent to him by Weber from Biscara, had the look of being erroneous. In preparations made from early stages of the boil, before ulceration had begun, he found in the dilated lymphatic vessels a filamentous mould, including the mycelial threads and gonidia either *in situ* or lying free; he did not hesitate, therefore, to assign the fungus as the cause of the disease. Exception was taken by Fayrer to that interpretation of the facts, on the ground that the fungus discovered in the boils was not to be viewed as the cause of them, but as an accidental concomitant. A more direct objection was raised to Carter's discovery by Laveran, who stated that neither he himself, nor MM. Kelsch and Kiénar, had been able to find anything at all like the fungus described, after an extremely careful examination of a large number of preparations of the affected tissues; he was constrained, therefore, to assume that the preparations sent from Algiers to England had been exposed to the invasion of moulds. More recently MM. Depéret and Boinet, and almost at the same time MM. Duclaux and Heydenreich, instituted a search for a parasite in the boil-disease; in both instances they have succeeded in detecting a micrococcus, which they have cultivated and inoculated upon men and animals, with the result of inducing the disease. The former pair of experimenters conclude that the microbe resides both in the pus and in the crusts, and that the disease may be transmitted directly by these matters, just as it is communicable by the cultivation-fluid.

It would take me much beyond my limits to give here a detailed account of the experiments.¹ I must leave it for the present undecided whether they can be adduced as unexceptionable; but the results arrived at we cannot but regard as a valuable contribution towards solving the question whether the disease is *communicable by inoculation* of the morbid products. That question does not now arise for the first time. Some of the earlier experimenters, such as Polak, Gröschl, Vandyke Carter and Wortabet, who had

¹ They are to be found in the 'Arch. de méd. milit.,' 1884, Nos. 7-8, and in the 'Arch. de physiol. norm. et pathol.,' 1884, No. 6, p. 106.

tried the experiment of inoculation on themselves, did not succeed in producing the disease, and therefore pronounced against its communicability. Others, like Fleming, Weber and Murray, who had also experimented on men (Fleming on himself), attained a positive success. There can be no well-grounded doubt, therefore, of the communicability of the boil; and at the same time we obtain indirect evidence of the parasitic nature of the morbid cause. The question remains whether the scene of the parasite's life and reproduction is to be placed exclusively in the human body, the infection taking place from man to man, as in syphilis, and the disease being included among the contagions in the proper meaning of the word; or whether that kind of transmission is only exceptional, whether the parasite does not rather vegetate and reproduce itself outside the body of man, and as a rule reach the body from the outer world. In my opinion, the question should be answered in the second of these ways. In favour of that is the exceedingly narrow limitation of the foci of disease to particular spots, the immediate neighbourhood being absolutely exempt; also the absence of all proof that it has ever been carried from one of these centres to a place hitherto free from it; thirdly, the association of the outbreak with particular seasons; and lastly, the fluctuations in the number of cases as observed over considerable periods.

All these facts, it seems to me, furnish indubitable proof that the morbid factor is not bound up with human kind, but is associated with certain localities and depends for its potency upon certain influences of the passing time. Assuming that view to be correct, the conjecture already mentioned acquires some degree of probability, namely, that the parasite reaches the water from the soil, perhaps by an intermediary host, and reaches the human skin in the course of washing with the water.

This hypothesis finds support in the observations that have been made of the occurrence of *the disease in animals*. According to statements by Smith, Vandyke Carter, Murray and Wortabet, dogs are often affected by it in Syria and India. In Algiers it has been seen in the horse. The muzzle and parts adjoining are almost the seats of it in

the dog; and these are the parts that come oftenest and longest into contact with water.

I have still to consider in a few words the manner in which transmission from man to man is accomplished, when that exceptional event does take place. I shall meet also the objection that has been raised against the parasitic nature of the boil, on the ground of the long period of latency which some cases of it have exhibited. Regarding the first point, there is much to be said for the opinion put forward by Seriziat, and afterwards by Laveran, that the communication is effected, as in the case of malignant pustule, mostly by *winged insects*. In that sense we ought to read the statement of Tscherepkin, that in Tashkend the malady is referred to the bite or sting of certain insects, whence its name of "pashsha chûrdj" or fly-bite.

The objection raised by Harley, Alcock and others against the parasitic theory of the disease, is that an incubation-stage of several weeks or even months, such as may occur in persons who become affected with the boil some time after leaving an endemic seat of it, does not accord well with the idea of a parasitic disease. But I think I may point to the analogous experiences with the malarial poison, which is beyond all question of the nature of a parasite; and perhaps also to the poison of rabies, which has not yet been proved to be parasitic but probably is so. When the virus of the boil is directly introduced by inoculation, the incubation-stage lasts, it is true, only some ten or twelve days; but it is not known, and it could not very well be ascertained at any of the disease-centres, how long the stage of incubation might last when the poison is insinuated through the unbroken skin.

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Nepaul Tumour of the Ear.

§ 229. CHARACTERS AND CIRCUMSTANCES OF THE TUMOUR.

Under the name of pendulous tumour of the ear, Campbell¹ and Bramley² have described a peculiar formation of the skin which is endemic in the village of Nilkantha, situated in one of the valleys of Nepaul at the foot of the Sheopuri range.

Clinical history.—The beginning of the malady is a small, firm swelling of the skin of the ear, elastic to the touch, which reaches the size of a pigeon's egg in four to eight weeks; it adheres to the subcutaneous tissues by a broad base, and is but slightly moveable. The only trouble that it causes for some time is its unsightliness; but when it grows rapidly, the skin becomes bluish and as if traversed by a network of vessels, and a painful feeling of tension is produced. When

¹ 'Trans. Calcutta Med. Soc.,' 1833, vi, 428.

² *Ib.*, 1835, vii, 71.

the swelling is punctured, a thick whitish fluid issues. It grows until it attains the size of an orange or a child's head, so that it sometimes reaches to the patient's shoulder. Gradually its contents soften and become absorbed, the membrane forming the sac of the tumour shrinks, and nothing remains at length but a shapeless thickening of the ear. The growth always takes place on the external or anterior side of the concha, usually on both ears; and not unfrequently there are several tumours in the same person, never coexistent, however, but one following the other.

There is complete obscurity as to the cause of this remarkable form of tumour, which never occurs on any other part of the body. The inhabitants of the particular valley have nothing in the local or hygienic or other circumstances of their existence to distinguish them from the villagers around. The natives lay the blame on the drinking-water; in which Bramley found mere traces of mineral constituents. Campbell alleges that the tumour occurs unusually often along with goitre; but Bramley denies that there is any genetic connexion between the two diseases. It is a noteworthy fact that the pendulous tumour of the ear is much commoner in women than in men.

Epithelial Cancer.

§ 230. SPECIAL FREQUENCY OF EPITHELIOMA IN CASHMERE; CAUSES OF IT.

I have to speak of cancerous growths of the skin under two special sets of circumstances which have a particular interest for our geographical and historical inquiry.

One of these is the unusually frequent or endemic occurrence of the disease in some parts of *India*. We have information about it by Day¹ from Cochin and by Fuller² from Tellichery, both places being in the southern part of the Malabar Coast; it is also reported by Maxwell³ from the

¹ 'Madras Quart. Journ. of Med. Sc.,' 1862, Jan.,'

² *Ib.*, 1863, July, p. 182.

³ 'Lancet,' 1879, Feb., p. 152.

vale of Cashmere, on the slope of the Himalaya beyond the north-eastern frontier of the Punjaub. According to the two former observers, cancer of the face is common in the extreme south of India: "There is a common disease on this coast," says Fuller, "which I do not remember to have seen (nearly so often) in any other part of India—cancer of the mouth and face, epithelioma, epithelial cancer; it also frequently shows itself on the penis." Of the cause of its frequency he tells us nothing. Maxwell's information from the vale of Cashmere is more detailed, and bears out what his predecessor Elmslie had already said of the truly endemic prevalence of epithelioma in that country. Whereas the hospital of Lahore had only eleven cases of malignant new growth among 22,123 patients in 1873; at the Cashmere Mission Dispensary in the year 1874-75, the cases of epithelioma reached the large total of 49 among 3924 patients, so that this disease represented 1.24 per cent. of all the cases. Of 54 cases collected, 27 were epitheliomas of the abdominal wall, 15 of the skin of the thigh, 2 of the leg, one each of the lip, tongue, male breast, forearm, elbow, finger, hand, scrotum, foot, and sole of the foot; it never occurred on the penis, and the author connects that immunity with the practice of circumcision, the people being Mohammedans. The majority of the cases (85 per cent.) were in men, most of whom were over forty years of age, a child of three forming a notable exception. It is not at all probable that climate has any influence in making the disease so common; the real occasion of its frequency is to be found rather in lesions of particular parts of the body, the same being due to a custom of the inhabitants. During the winter, owing to their inadequate clothing, the people of the vale of Cashmere—men, women and children—wear under their loose garments a "kángri" or charcoal brazier, about four inches in diameter, made of clay and covered with wicker, which contains burning coals or wood-charcoal; it comes often into contact with the skin of the belly, especially in the sitting or squatting posture, when the wearer of the brazier rests it between the thigh and abdomen, and blows upon the glowing embers from time to time through a slit in his clothing. That practice is the explanation of the

after a time, turns red on the top and sheds the epidermis, so that a broken surface appears, which secretes pus and looks to be covered by a scab; the resulting sore is at first shallow, but it changes to an excavated ulcer with hard elevated edges and a callous foul floor; meanwhile the adjoining skin gets excoriated by the pus from the sore. In course of time other warty excrescences arise round the affected spot, which go through the same stages; so that there ensues at length a more or less extensive ulcerous surface bounded by a raised margin, yielding an abundance of ill-smelling ichor, and with a cauliflower appearance on its floor due to the continual growth of warty and fungous excrescences. The affection is at first superficial, involving not unfrequently the whole scrotum and even the perineum; afterwards it extends to the deep tissues, the whole subcutaneous investment of the scrotum looks thickened, the inguinal glands enlarge, and, if the disease lasts long, they may even suppurate. The general health of the patient, which was at first little affected, suffers perceptibly as soon as the local disease has gone as far as we have described; pain, which was insignificant at the outset, now comes to a great height, the patient wastes visibly, he acquires a leaden or ash-pale look, and the exhalations from the skin smell offensively. Death is attended with hectic phenomena; in rare cases it is hastened by peritonitis or pneumonia, or, more rarely still, brought on by copious bleeding from the affected parts. Cancerous affections of the internal organs have not been noted in this form of cancer, so far as I can gather from the writings which I have consulted. The alleged cancerous degeneration of the testis appears to be also doubtful; for Lawrence says that the infiltration goes no deeper than the connective tissue supporting the tunica vaginalis, that tissue being very much thickened and affording a sort of protection to the testis.

Although the skin of the scrotum is not the only seat of the malady, it is the seat of it in most cases. Of 44 cases of chimney-sweeps' cancer collected by Hutchinson and Jackson, 42 had the disease on the scrotum, one on the glans penis, and one on the knee. Cooper saw it twice on the cheek, and Rose¹ saw it on the nose of a chimney-sweep. Earle² reports a case where epithelioma appeared on the wrist of a gardener, who was in the habit of sprinkling soot every spring to kill the slugs. In other cases it has occurred on the foot and the knee.

Epithelioma of the scrotum under these circumstances, or in the form of chimney-sweeps' cancer, is on the whole very rare, and in fact almost confined to *England*. Syme, in reporting a case that he had in Edinburgh,³ says that the chimney-sweeps in Scotland never get it, that any patients with it in that country had acquired it in London or other

¹ 'Med. Gaz.,' 1830, Dec., vii, 416.

² In his edition of Pott's 'Chirurgical Works,' l. c.

³ 'Edin. Med. and Surg. Journ.,' 1835, July, p. 13.

large English town, and that this was the first case that he had seen in the hospital practice of Edinburgh since he was a student, or in his private practice. It is stated by Breschet¹ that Dupuytren had a case of chimney-sweeps' cancer in Paris in 1814; Bayle's² opinion is that it must be extremely rare in France "*supposé qu'elle y existe.*" Merat,³ on the authority of private information, says that Gosse had seen a few cases in Italy. In the medical literature of Germany I have found no cases described which could be taken for this disease. Lastly, it is a noteworthy fact that the number of cases has diminished greatly in England during the last twenty or thirty years.

§ 232. EXPLANATIONS OF ITS ORIGIN.

There can be hardly any doubt that the most important cause of this malady is the intense irritant action of soot on the skin,⁴ and, it would seem, of soot from coal fires more especially. It stands to reason that an influence of that sort would make itself felt most at those parts of the body where the particles adhered closest, and all the more so if cleanliness were neglected; in that way we explain the almost uniform occurrence of the cancer in the folds and wrinkles of the voluminous scrotal integument, a region of the surface which is least often subjected to a thorough cleansing by people of that class, and is moreover constantly exposed to the friction of the clothes. The opinion was held for a long time in England that the chimney-sweeps who ran most risk and were most often attacked by cancer were those who went through the flues; these would in fact be for the most part boys who were small enough to pass; and it is well known that they were much employed at that business in the large English towns. But that view is erroneous, as Pott and Earle formerly pointed out. The disease is extremely rare in young people, in boys or youths under twenty; it has been seen oftenest in men from thirty to forty years of age.

¹ In the '*Dictionn. de Méd.*' art. "*Cancer.*"

² In the '*Dictionn. des sciences médicales*,' art. "

³ *Ib.*, vol. xlvii, 166.

⁴ Earle's case in a gardener is

Syme's case was in a man aged thirty, who had been sweeping chimneys since he was five, and had the disease first when he was twenty-eight. Of four cases reported in the 'Medical Gazette' (loc. cit.) one was in a boy of eleven, who had been a chimney-sweep since the age of six, and another was in a man of sixty-seven who had been at the same occupation since his seventh year. Among the 44 cases collected by Hutchinson and Jackson, there are several from sixty to seventy years of age.

The decline of the disease of recent years, as Lawson points out, is not to be attributed to the Chimney-sweepers Act, which put a stop to the employment of boys, but rather, as he thinks, to the fall in the value of soot. So long as that substance fetched a high price, it was the chimney-sweep's object to collect all that could be got from the flues; and, as much of it was mixed with mortar and pieces of stone, it had to be passed through a sieve. That laborious work, which was not done by boys, involved much active exertion and strain, causing perspiration and a state of excitement of the skin; moreover the movements of the body backwards and forwards, or from side to side, had inevitably the effect of making the scrotum to rub hard against the clothes, which would be saturated with soot. I am unable to decide how far that explanation is relevant; but I think we may conclude from the comparative rarity of the malady even in former times, that there is always needed some predisposition in the individual or the influence of some other exterior factors which we cannot define more exactly, before the disease will develop.

Rayer¹ says that some cases of a disease analogous to chimney-sweeps' cancer have been seen in miners who had to do with *arsenic*, the skin of the scrotum being again the seat of it.²

¹ 'Traité théorique et pratique des Maladies de la Peau,' Paris, 1826. (Germ. ed., Berl., 1838, ii, 454.)

² [Warts and sores, corresponding to the soot-warts and subsequent epitheliomatous infection, have been observed among workers in coal-tar at Dublin.]

*Phagedænic Tropical Ulcers.*¹

§ 233. ENDEMIC SEATS OF FOUL SLOUGHING ULCER.

The endemic occurrence of malignant ulcerations in the tropics is a phenomenon of special interest among the morbid conditions of the skin. They arise mostly on the lower limbs, and always from superficial wounds, which may be of the most trifling kind. Their occurrence is all the more remarkable that simple cuts, and even extensive operative incisions, heal much more quickly and safely, *cæteris paribus*, in subtropical and tropical countries than in colder latitudes. "On peut se convaincre," says Levacher with reference to the West Indies, "que toutes les plaies, et plus exclusivement celles qui sont faites par les instruments tranchants, guérissent avec une promptitude que l'on ne saurait rencontrer dans les pays froids et tempérés;" and other authorities² from the West Indies confirm that, as well as many more from Nicaragua,³ Guiana,⁴ Madeira,⁵ Senegambia,⁶ the Gold Coast,⁷ the Soudan,⁸ Algiers,⁹ Tunis,¹⁰ Egypt,¹¹ Abyssinia,¹² Zanzibar,¹³ India,¹⁴ the Malay Archipelago,¹⁵ Cochin China,¹⁶

¹ This section is taken a little out of the original order, the paragraphs 233—238 corresponding to §§ 250—255 of the German edition.

² Moulin, 'Pathol. de la race Nègre dans les pays chauds,' Par., 1866, 33.

³ Bernhard, 'Deutsche Klinik,' 1854, Nr. 2.

⁴ Blair, 'Account of the Last Yellow Fever Epidemic,' Lond., 1850, 21.

⁵ Kämpfer, 'Hamb. Ztschr. für Med.,' 1847, xxxiv, 150.

⁶ Chassaniol, 'Arch. de méd. nav.,' 1865, Mai, 518; Thaly, ib., 1866, Nov., 375; Borius, ib., 1882, Mai, 374.

⁷ Michel, 'Notes méd. rec. à la Côte-d'or,' Par., 1873, 41.

⁸ Ballay, 'L'Ogooué, Afrique équatoriale occidentale,' Par., 1880, 37.

⁹ Armand, 'Méd. et hyg. des pays chauds,' Par., 381; Creissel, 'Mém. de méd. milit.,' 1873, Juill., 337.

¹⁰ Ferrini, 'Saggio sul clima e sulle malattie della città di Tunisi, &c.,' Milano, 1860, 132.

¹¹ Pruner, 'Krankh. des Orients,' 153.

¹² Petit in Lefebvre, 'Voyage,' i, 24, 380.

¹³ Lostalot-Bachoué, 'Essai sur la constitution phys. et méd. de l'île de Zanzibar,' Par., 1876, 54.

¹⁴ Auboeuf, 'Contribution à l'étude de l'hyg. et des malad. dans l'Inde,' Par., 1882, 66.

¹⁵ Waitz, 'On Diseases incident to Children in Hot

¹⁶ Didiot, 'Relation méd.-chir. de l'année 1841'

China¹ and the Hawaiian Islands.² That rapidity of healing holds good particularly for the coloured races, such as negroes and Malays, who are the very people to furnish the largest number of cases of those phagedænic ulcerations of the skin which we are now to speak of. Again, it holds good only for simple and clean wounds in healthy persons; for, if the injury be a lacerated or contused or other complex form of wound, and particularly if the individual who receives it be the subject of one of the morbid diatheses that are apt to develop in the tropics, it is exceedingly common for the wound to result in destructive ulceration that may even endanger life.

In Abyssinia, says Petit,³ the wounds of operations heal easily, but contused wounds, excoriations and such-like injuries of the skin, especially if they be on the lower extremities, lead to sloughing, which not unfrequently takes on a malignant type. Almost the same language is used by Bajon⁴ and Blair (l. c.) for Guiana, and by Bernard (l. c.) for Nicaragua.

"Une remarque que nous avons eu occasion de faire," says Lesson,⁵ "montre combien le climat de Taïti est peu propre à la guérison des plaies. Un grand nombre de matelots, en marchant sur les coraux les pieds nus, se firent des légères blessures; d'autres et surtout les officiers, en allant à la chasse, eurent les parties nues coupées par une herbe très tranchante, analogue à nos carex, appelée piripiri. Toutes ces petites plaies qui intéressaient à peine le derme, et qui n'étaient que des égratignures, s'enflammèrent et suppurèrent, n'étaient point encore guéris un mois après notre départ par des latitudes plus sud."

Even in more temperate climates, such as those of *Algiers*,⁶ *Egypt*⁷ and the interior parts of *South Africa*,⁸ that same serious trouble is felt; but in the tropical world there is hardly a country in which it does not bear more or less

Breton, 'Considération sur la guérison des playes chirurg. et traumatiques chez les Annamites,' Par., 1876.

¹ Dudgeon, 'Glasgow Med. Journ.,' 1877, July, 329.

² Duplony, 'Arch. de méd. nav.,' 1864, Dec., 486.

³ L. c., and 'L'Expérience,' 1839, Oct.

⁴ 'Nachrichten zur Gesch. von Cayenne, u. s. w.' From the French. Erfurt, 1778, i. 9, 87.

⁵ 'Voyage méd. autour du monde,' Par., 1829, 55.

⁶ Bertheraud, 'Med. et hygiène des Arabes,' Par., 1855.

⁷ "Ueber einige Krankh. des Orients," Augsb., 1837, 84; Flora, 'Aerztl. Anstalten,' Wien, 1869.

⁸ 'r. der Wiener Aerzte,' 1858, 166; Fritsch, 'Arch. für

the character of an endemic: as in *Mexico*,¹ the *West Indies*,² *Guatemala*³ and other *Central American*⁴ States, *Guiana*,⁵ *Senegambia*,⁶ the *West Coast of Africa*,⁷ *Fernando Po*,⁸ the *Soudan*,⁹ *Madagascar*¹⁰ and the small islands near it,¹¹ the *Mozambique coast*,¹² *Zanzibar*,¹³ *Somali Land*,¹⁴ several archipelagoes of the *Pacific*,¹⁵ *China*,¹⁶ the *Malay Archipelago*,¹⁷ parts of *India*,¹⁸ such as Lower Bengal, Orissa, Arracan, the

¹ Bouffier, 'Arch. de méd. nav.,' 1865, Mai, 535.

² Hunter, 'Obs. on the Diseases of the Army in Jamaica.' Germ. ed., Lpz., 1792, 307; Chisholm, 'Manual of the Climate and Diseases of Tropical Countries, &c.,' Lond., 1822, 23, 128.

³ Durant, 'Arch. de la méd. Belge,' 1846, Mai.

⁴ Wagner, 'Beitr. zur Meteorologie und Klimatologie von Mittel-Amerika,' Dresd., 1864, 24.

⁵ Rodschied, 'Bemerk. über das Klima . . . von Rio Essequibo,' Frft., 1796, 305; Blair, l. c.; Chapuis, 'Arch. de méd. nav.,' 1864, Mai, 375; Thaly, 'De l'ulcère phagédénique des pays chauds à la Guyane française, &c.,' Montp., 1864; Maurel, 'Arch. de méd. nav.,' 1879, Nov., 347; le Dantec, ib., 1885, Juin, 448.

⁶ Thaly, 'Arch. de méd. nav.,' 1867, Sept., 182; Berger, 'Considér. hyg. sur le bataillon tirailleurs Sénégalais,' Montp., 1868, 58; Defaut, 'Hist. clinique de l'hôpital maritime de Gorée, &c.,' Par., 1877; Rey, 'Arch. de méd. nav.,' 1877, Juin, 401; Hebert, 'Une année médicale à Dagana,' Par., 1880, 39; Borias, 'Arch. de méd. nav.,' 1882, Mai, 377.

⁷ Boyle, 'Acc. of the Western Coast of Africa, &c.,' Lond., 1841, 404; Daniell, 'Sketches of the Med. Topogr. of Guinea,' Lond., 1849, 56, 138, 180; Clarke, 'Transact. of the Epidemiol. Soc.,' 1862, i, 107 (relating to the English settlements); Féris, 'Arch. de méd. nav.,' 1879, Mai, 330 (Slave Coast); Griffon du Bellay, ib., 1864, Janv., 58; Monerot, 'Considér. sur les malad. endém. observ. à l'hôpital du Gabun,' Montp., 1868, 39; Abelin, 'Étude sur le Gabun,' Par., 1872, 31 (Gaboon).

⁸ Iglesias y Pardo, 'Observ. teor.-prat. sobre las fiebres africanas de Fernando Po,' Ferrol., 1877.

⁹ Ballay, l. c.; Nachtigal, 'Sahara und Sudan,' Berl., 1881, ii, 469 (Bornou).

¹⁰ Grenet, 'Arch. de méd. nav.,' 1867, Mars, 233.

¹¹ Monestier, ib., 1867, Juin, 417 (Mayotte); Deblenne, 'Essai de géogr. méd. de l'île de Nossi-Bé,' Par., 1883, 140 (Nossi-Bé).

¹² Azéma, 'Gaz. des hôpit.,' 1861, 46, and 'Arch. gén. de méd.,' 1863, Oct.; Deblenne, l. c., 240.

¹³ Lostalot-Bachoué, l. c.; Burton, 'Zanzibar, its City, &c.,' Lond., 1872.

¹⁴ Steinhäuser, 'Transact. of the Bombay Med. Soc.,' 1855, New Ser., II, 241.

¹⁵ Fox in Wilkes, 'Narrative of the U. S. Exploring Expedition, &c.,' Philad., 1845, iii, 345; Pénard (quoted by Aude, 'Essai sur le phagédénisme dans la zone tropicale,' Par., 1866, 18), and Charlopin, 'Notes méd. rec. en Calédonie,' Montp., 1868, 24 (New Caledonia).

¹⁶ Wilson, 'Med. Notes on China,' Lond., 1846, 51, 7.

¹⁷ Steenstra-Toussaint, 'Zeitsch. der Wien. Ak. Madura).

¹⁸ See Burnard, 'Transact. of the Calcutta Med.

Malabar coast and Sind ; while the countries that seem to be most subject to the sloughing of sores are *Cochin China*,¹ and the islands and shores of the *Red Sea*,² including both the Arabian side from Yembo down to Aden, and the Abyssinian shore.

The following facts will give some notion of the enormous frequency of sloughing sores at some of the places in the above list: In the hospital of Cayenne the patients suffering with that kind of ulceration have amounted to 22 per cent. of the total annual admissions ; for example, in 1861 there were 1812 cases of it in a total of 8373 admissions of French convicts. In Cochin China, after the annexation of Tourane, there were, among 5600 French troops, 700 patients with the ulcer, and of these 160 died. "After the annexation of the island of Fernando Po," says Boyle, "the disease became so terribly prevalent among the negroes in Sierra Leone that at one time (1860) the hospitals devoted to the use of free negroes were crowded with cases of ulceration." In Penard's report (1854-55) on New Caledonia, we read: "Les ulcères cutanés à Port-de-France font le désespoir, sinon des hommes qu'ils exemptent du service pour un temps toujours fort long, du moins des commandants et des chirurgiens. La 'Constantine,' le 'Catinat,' le 'Prong' et 'l'Aventure' ont eu tous jusqu'au sixième de leur équipage exempt de service pour cette seule cause, pendant des mois entiers."

'Researches into the Causes . . . of the more Prevalent Diseases of India,' Lond., 1841, 544; Geddes, 'Clinical Illustr. of the Diseases of India,' Lond., 1846, 156; Wylie, 'Transact. of the Bombay Med. Soc.,' 1855, New Ser., ii, 76; Craig, ib., 1859, iv, App. xxv; Shortt, 'Indian Annals of Med. Sc.,' 1858, July, 505; Chevers, ib., 1860, Nov., 205; Cleveland, 'Madras Quart. Journ. of Med. Sc.,' 1863, Jan., 26; Auboeuf, l. c.

¹ Rochard, 'Arch. gén. de méd.,' 1862, Juin, 667; Linquette, 'Mém. de méd. milit.,' 1864, iii, sér. xi, 112; Armand, ib., 114; Bassignot, 'De l'ulcère de Cochinchine,' Strasb., 1864; Moisson, 'Essai sur l'ulcère de Cochinchine,' Montp., 1864; Laure, 'Hist. méd. de la marine française pendant les expéditions de Chine et de Cochinchine,' Par., 1864, 126; Ollivier, 'Observ. faites en Algérie, Chine et Cochinchine, &c.,' Strasb., 1864, 55, 85; Didiot, l. c.; Aude, l. c.; Richard, 'Arch. de méd. nav.,' 1864, Mai, 343; Bernard, 'De l'influence du climat de la Cochinchine sur les malades Européens,' Montp., 1867, 51; Girard de la Barcerie, 'Considér. méd. sur la Cochinchine, &c.,' Montp., 1868, 43; Jourdeil, 'Mém. de méd. milit.,' 1869, Mai, 380; Breton, l. c., 36.

² Combes et Tamisier, 'Voyage en Abyssinie,' Par., 1839, i, 43, 116; Aubert-Roche, 'Annal. d'hyg.,' xxxiii, 32; Lachèze, 'Bull. de l'Acad. de méd.,' 1844, Juin, 885; Pruner, l. c., 153; Petit, l. c.; Malcolmson, 'Journ. of the Roy. Asiat. Soc.,' viii, 279; Howison, 'Transact. of the Bombay Med. Soc.,' 1840, iii, 82; Campbell, ib., 84; Peet, ib., 1851, 174; Steinhauser, l. c.; Craig, l. c.; Vinson, 'L'Union méd.,' 1857, Nr. 4, 5; Bechtinger, 'Wien. med. Presse,' 1869, Nr. 51, 52.

§ 234. GROW OUT OF SLIGHT WOUNDS, ESPECIALLY ON THE FEET.

The ulcers develop always from a surface injury, which is often very trifling,¹ such as slight abrasions of skin produced by scratching, or by pressure of the foot-coverings or the like, superficial contused wounds, slight injuries of the skin made on the bare feet by sharp stones or thorns, or by the stings and bites of insects, the lodgment of sand-fleas or guinea-worms under the skin; sometimes even after skin-eruptions such as eczema, which break the continuity of the epidermis. The fact of the lower extremities being chiefly exposed to slight injuries of that kind explains why the ulcers are mostly on the feet or the region of the ankle and the leg, much more rarely on the thigh, and seldomer still on the upper extremity.

The type of the diseased process is the same everywhere; at whatever point they may occur the sores are the so-called "atonic ulcers;" very often they take on a phagedænic character, so that the destructive process, which in less malignant cases is limited to the skin and subcutaneous tissue, and to a moderate area of these, extends both in breadth and depth, involving muscles and tendons, and in some cases even bones, until the ulcer covers a great part of the limb, and the patient may even die with symptoms of hectic or pyæmia. This malignant phagedænic type of ulceration occurs at some places much more commonly and in much more pronounced degrees than at others; thus a special degree of malignancy is implied in the names "Yemen sores," "Aden ulcers" and "Malabar ulcers."

§ 235. AIDED BY AN ENFEEBLED CONSTITUTION AND A DAMP ATMOSPHERE.

An important element in the causation of these ulcers is found to be a *feeble state of the general health*, which will

¹ "La plus légère blessure," says Griffon du Bellay, "était le point du départ d'ulcères qui ne guérissent." Rochard: "Une plaie insignifiante, une érosion s peuvent en devenir le point de départ."

have had its source either in the tropical climate or in other diseased conditions dependent on the latter, or in the individual's mode of life. The endemicity of the ulcerations within the tropics points conclusively to the morbid influence of *climate*, including more especially high temperature and extreme degrees of atmospheric moisture; and, as a matter of fact, the malady occurs in regions where the meteorological conditions distinctive of the tropics are most declared: such as the coasts of the Red Sea, Guiana, many places on the West Coast of Africa, Cochin China and the Malabar coast, being the localities where the climatic conditions leave the mark of tropical anæmia on the constitution most certainly and most profoundly. Moreover, the climate would appear to exert also a direct influence in the production of the ulcers and in determining their type; for, according to Chisholm for the West Indies and Burnard for Lower Bengal, the sores are not only more common during the hot and rainy seasons, but also more pernicious. Steinhauser, whose experience relates to Aden, says: "They [the ulcers] are highly susceptible of atmospheric influences, deteriorating in appearance on damp, hot days, improving in dry weather." Another piece of evidence is that change of climate is one of the best means of overcoming their feeble disposition to heal.

§ 236. MOSTLY FOUND IN LOW AND DAMP LOCALITIES. RELATION TO MALARIA AND SCURVY.

Climate also explains, in part at least, the fact that the malady is mostly associated with certain *kinds of ground*, low and damp tropical situations, sea-coasts, the shores of large rivers, and swampy districts; while the disease as an endemic finds its limit at elevated and dry localities in the immediate neighbourhood of the affected points. Thus it is remarked by Petit that the places on the Arabian coast most severely affected by the morbid process are the lowest and dampest, such as Kunfuda, situated below the sea-level, and the island of Camaran; while more elevated and drier localities of the country suffer little from it, and the interior of Arabia, with

a very high temperature but comparative dryness of the air. has none but imported cases. Referring to the Yemen scores Pruner says: "It is not difficult to mark out the topographical limits of this malady; it confines itself to ~~alluvial~~ soil, saturated with brackish water, charged with ~~marine~~ products, and usually growing soda-yielding vegetation ~~only~~. If any cases are met with farther inland, on the foot-hills or among the mountains, they are in persons who had brought the malady with them from the lower level."

The significance of these states of soil for the pathogenesis partly consists, as we have seen, in the effect that they have upon the climate; partly, also, in their causal relation to *malarial disease*, which is a factor in the etiology of the ulcers (according to Wilson, Deblenne, Moisson, Ande, and Bassignol) in so far as its long continuance induces a cachectic state and thereby creates a predisposition in the individual to take on the morbid process of the skin. That the latter should not be regarded as a direct outcome of malarial infection, is shown by the fact of the ulcers being not less common in countries like New Caledonia and the Abyssinian highlands (Bechtinger), which are free from malaria, than in the worst malarious centres.

Scurvy is another disease that plays the same part as malaria in the etiology of these ulcerations. As we have seen in a former part of this work (vol. ii, 528) scurvy is endemic in many of the tropical localities subject to ulcers, such as the shores of the Red Sea. The coincidence of the two diseases in place has led several observers to make them out to be identical, or to regard the ulcers as a symptom of scorbutic disorder. There can be no question that a scorbutic affection may predispose to the development of ulcers of the skin (Rochard); but the relation of those diseases one to another extends no farther than that (Craig, Horn, Bechtinger); and the real scorbutic ulcerations of the skin are of an entirely different type from those that we are now considering.

Steinhauser, writing of Aden where both forms are common and equally pernicious, says (l. c., p. 24) if a scorbutic patient be suffering at the same affection will neither heal nor improve in a

is removed. On the other hand, all symptoms of scurvy may have yielded to treatment, yet sloughing proceed with increasing severity. This phenomenon has been frequently observed, and convinces me that 'Helcoma Yemensis' is not necessarily, as a cursory observer might suppose, a scorbutic affection."

§ 237. BROUGHT ON BY PRIVATION, FATIGUE AND THE LIKE.

Undoubtedly the most decisive thing in the production of tropical ulcers is always the feeble health of the individual; and that may be due to *poor diet, bad lodging, severe antecedent disease or cachexia still remaining, especially tropical anæmia*, or to *excessive bodily fatigue*, and the like, the tropical climate exercising its influence all the while. Accordingly the disease is commonest, in the experience of all observers, among the poorer classes, in those most exposed to privations and fatigue, such as workmen, sailors, labourers, beggars and common soldiers; on the other hand it is quite exceptional to see it among the better-off classes, as for example, among the officers of a regiment in which it exists.

Connected herewith is the other fact that it is the *coloured races* which furnish the great majority of patients suffering from ulcer; whereas Europeans are subject to it only under special circumstances, as in the case of bodies of troops when they have been undergoing severe exercise, or of sailors with more than their ordinary duties, especially if they had become anæmic from being long in the tropics.

In the Abyssinian War of 1867, the soldiers of British regiments, according to Bechtinger, had proper and sufficient diet and remained quite free from ulcers, so far as the writer knew; but it was altogether different with the "Hindus, whose caste did not allow them to eat flesh, and who had no kind of vegetable substitutes for it as at home, but had to extract what sustenance they could for their exhausted powers from rice, ghee (clarified butter) and compressed vegetables, which were served out to them in rather meagre rations." Azéma says that Europeans coming from Réunion or other places to the Mozambique coast, become subject to ulcers as soon as they fall into the same wretched ^{circumstances}. In Cochin China, ulcers were hardly seen until 1856, although they are endemic among ^{certain} circumstances became more trying ^{in consequence of} campaigns; and, after

many had been down with malarial fever, dysentery and the like, ulcers began to occur to a frightful extent, particularly in the marshy situations of Saigon and Tourane. So direct was the connexion between the attacks of ulceration and these harmful influences, that Rochard, the authority for the fact, says (l. c. p. 684): "Leur nombre et leur gravité ont toujours été en raison directe des fatigues, des privations, et des maladies causées par le climat;" and he adds that, if the English troops in Aden suffered less, it was solely because their hygienic circumstances were better than those of the French troops in Cochin China.

§ 238. NOT A FORM OF HOSPITAL GANGRENE. THE INEVITABLE MICROBE.

Experience hitherto has not enabled us to decide whether anything of a special kind and with a specific action determines or favours the occurrence of these ulcerations of the skin. One doctrine, that has been often controverted before, must be set down at once as erroneous, namely, that the phagedænic process of ulceration is an affair of *hospital gangrene*. That is a disease which certainly plays a prominent part in the tropics as we have seen elsewhere in this work (vol. ii, 481); and it is undoubted that a very large number of these "phagedænic" ulcers, especially those met with in hospitals, belong to it. But it is by no means true of the whole of them. Apart from the fact that the ulcerations which we have been considering have a different type and course from those caused by hospital gangrene, we are met by the circumstance that they assume the phagedænic character quite independently of the influences which bring about that disease; and by the other fact that there has not been a single well-authenticated observation of the ulceration being transmitted by contagion to other surgical patients, not even under circumstances that are especially favorable to transmission, as in hospitals, and that experiments made on purpose to induce infection from them have failed.¹

Bechtinger remarks in his description of the disease among the Hindu troops in Abyssinia: "If there are any who are led to think of hospital gangrene when they read these lines, what will they say when I add that, in the very same hospital, all wounds made (not few in number and including the two am

¹ See Traill, 'Arch. de méd. nav.,'

tioned in the last chapter) healed rapidly. Not a single wound in the Zoulla hospital, that had been made by the knife, turned into a Yemen sore."

It was only to be expected that, in our bacteria-ridden age, the doctrine of parasitism should have extended to the ulcerations of which we have been treating. Le Dantec¹ has, in fact, found in the ichor of the sores bacilli and micrococci which are, in his opinion, the true cause of the phagedænic character of the process; he is persuaded, also, that the microbes are indigenous to the rice fields, and hence the reason why the country people in Anam suffer so much from the ulcers. The astonishing thing would be to have found no bacilli and micrococci in the discharges. We shall, in my opinion, be doing nothing disloyal to science if we view this discovery with sceptical eyes.

¹ *Ib.*, 1885, Mai, p. 448.

CHAPTER XXIV.

MADURA FOOT AND ELEPHANTIASIS.

§ 239. CLINICAL HISTORY AND MORBID ANATOMY OF MADURA FOOT.

The peculiar disease of the superficial and deep structures of the foot (rarely of the hand), which is endemic in various parts of India under the names of fungus-foot, mycetoma and the like, has not as yet been fully elucidated, although the probability is that it is of a parasitic nature.

In some of the very earliest European writings on disease in India, such as Kämpfer's,¹ mention is made of it under the name of "perical" or big foot; there is also a reference to it, in 1806, by Benjamin Heyne in his historical and statistical compilation on India; but in these references it is always mixed up with elephantiasis. The first hint of something peculiar in the malady is found in Brett's 'Surgery of India,'² and in the army medical reports of the Madras Presidency by Godfrey³ and Colebrook;⁴ while the first detailed description of it was given by Ballingal,⁵ and after him by Eyre.

Clinical history and morbid anatomy.—Few medical men have had the fortune to see the Madura foot in the first stage of its development. The indifference of the natives prevents them from seeking medical aid for it until the limb has come to be past using; so that ordinarily a number of years elapse during which the diseased foot degenerates to a shapeless, lumpy mass penetrated with fistulous sores. It may be

¹ 'Amoenitatum exoticarum politico-physico-medicae. fasc. V,' Lemgo, 1712. 561.

² 'Surgery of India,' Calcutta, 1840.

³ 'Reports by the Medical Board,' &c., Madras, 1850, 34.

⁴ *Ib.*, 390.

⁵ The references are given at the end of the section of the authors' names.

gathered, however, from the rare instances where the disease has been seen by a medical man soon after its commencement, as well as from the statements of the patients themselves, that it begins with one or more small, firm, painless and non-adherent nodules in the subcutaneous tissue. The usual seat of them is the foot, mostly the dorsum, sometimes its edge, sometimes the clefts of the toes. The condition has never been seen on both feet at once, and it is only in rare instances that it has been found on the hand. In the further progress of the malady, which is always a very slow one, the nodules grow both to the breadth and the depth, and become adherent and tender on pressure; the tenderness, together with the increasing deformity of the limb, being the reason why the patient has a certain amount of discomfort in walking. Meanwhile the general health continues quite unaffected. A few years having passed with the disease in that stage, lumpy masses begin to rise on the skin of the foot, which at length show perforations at their summits. It is not until that takes place that the patient ordinarily seeks medical advice; and he then presents the following characteristics:

His appearance is for the most part that of perfect health; there is never the slightest trace of morbid diathesis discoverable in the general condition. The foot (or hand) looks to be swollen to twice or thrice its ordinary size, or even more, and degenerated into a shapeless mass; the plantar (or palmar) hollow is levelled up, or even raised into a convexity; the toes are drawn widely apart and sometimes forced into otherwise irregular positions; the enlargement is abruptly marked off above, extending in some cases no farther than the anterior half of the foot, or to about the proximal ends of the metatarsal bones, but usually it extends to the ankle (or wrist), rarely beyond that or to the middle of the leg. At this advanced stage of the disease, the several constituent nodules are no longer distinguishable, the member appearing to be uniformly swollen; it feels elastic, and pressure on it with the finger gives the suggestion of touching a thin plate of metal, and causes the patient to wince. The skin does not look to be altered in texture, but it presents numerous irregular openings with rounded edges, through which a probe passes by tortuous sinuses among the soft tissues deep into the substance of the foot and even to the bones; they discharge a thin, sanious fluid of a yellowish colour and stinking odour, in which a number of small, irregularly-shaped, granular bodies are suspended, of bright yellow, or pink or black colour, and in consistence varying from soft to firm, like fish roe. Notwithstanding that the disease has progressed so far, the general health of the patient is for the most part still unaffected; it is only when the malady has been permitted to go on a very long time, or, in other words, amputation of the foot, the only radical means of cure, been neglected, that wasting and diarrhoea sometimes set in; and when these ensue, the patient has even been known to die of marasmus, but without any complication of disease in the abdominal or thoracic organs.

Morbid anatomy.—Examination of the diseased foot shows a variety

of conditions, according as the process had penetrated deeply or not; but they all agree in the main point of having the above-mentioned granular masses deposited among the tissues. They are found lying in cysts of the subcutaneous connective tissue and fat, or between the muscles, or in the spongy substance of the bones; the cysts vary in size from a pin-head to a hazel-nut. In a few cases the process is strictly confined to the connective tissue and subcutaneous fat; more often it extends between the other soft parts and reaches the bones, in which the first traces of implication are a chronic periostitis from pressure, and such after-effects of it as thickening of the compact substance or even osteophytic outgrowths; at a later stage, the compact substance disappears, the spongy bone becomes excavated into a honey-comb pattern, and the spaces filled with detritus, the bones becoming more and more soft and friable, but never showing carious degeneration. In still more advanced cases, the muscles become involved at length in the morbid process, and then all the tissues alike are changed into a uniform, jelly-like mass, so that the affected limb can be cut with a knife in all directions without encountering any real resistance. Bidie describes its condition as follows: "A scalpel may with the greatest ease be passed through and through the foot in all directions, its normal structure having become completely disorganised. A soft mass consisting of caseous-like matter, granular bodies, an unhealthy puriform pulp, adipose tissue and gelatinous-like substance, occupies the place of the soft tissues. Bones are either completely destroyed, or deprived of earthy constituents, honeycombed and easily torn or cut, the cavities made by the destructive process being occupied by the caseous or granular matter." The morbid process, accordingly, invades the connective tissue and fat first, then the bones and cartilages, and last the muscles; the tendons offer most resistance, and in one case Bidie found them almost intact when all the other tissues were turned into a mass of pulp.

§ 240. CHIEF SEATS OF FUNGUS-FOOT IN INDIA.

Hitherto the disease has been seen only in *India*;¹ but in that country it is found over a wide area. So far as our very incomplete information goes, the fungus-foot occurs in many parts of the Carnatic (Malabar Coast and inland places near); at Pondicherry and Carical; at Bellary, Tanjore, Guntoor, Madura, Cuddapah, Trichinopoli and Comba-

¹ Occasional cases have been seen in Hindus who had gone to Réunion, Cochin China and Guiana. The statement in the 'Arch. de méd. nav.' (Janv., 1877, p. 22) that the disease is often met with in Borneo, is altogether unsupported, and probably rests on an error of diagnosis.

conum; on the slope of the Western Ghâts; in Rutnagherry, Poonah, and many other districts of the Bombay Presidency; in Kattiwar, Gujerât and Cutch; Kurachee and other places in Sind; in Bhawalpur, Bicanir and other parts of Rajpootana; in Jhelum (Punjaub); and in Sirsa and Hissar (N.W. Provinces). It appears to be very rare in Bengal, no cases being reported from that Presidency; the few cases that have been seen at Calcutta have been in persons who had come from other centres of the disease; in the cities of Madras and Bombay, also, those who have been seen with it have been mostly strangers.

Vandyke Carter¹ remarks that we may get some idea of the great frequency of the disease in the Bombay Presidency from the fact that twenty cases and upwards have come under the notice of each of the several observers, one surgeon having sent him a report of more than seventy-five cases seen by himself. In Bombay, where the disease, as already remarked, is not endemic, a year seldom passes without three or four cases of Madura foot being admitted into the Jamsetjee Jejeebhoy Hospital.

§ 241. NO SPECIAL RELATION TO CLIMATE AND SOIL.

The distribution of the disease appears to be quite independent of influences of *climate* and *weather*; and it shows just as little relation to particular *kinds of soil*. Colebrook, Ballingal and others were disposed to attach much importance to the fact that Madura foot was indigenous, so far as their experience went, solely on "cotton soil," a dolomitic detritus rich in vegetable matters, saturated with moisture, and very fruitful; and that it did not occur on other kinds of rock, such as laterite or ferruginous clay. But subsequent observations have not confirmed the correctness of that; the disease has been found on clayey limestone in Cuddapah, on clay at Pondicherry, and on alluvial soil at Tanjore and at places on the Malabar Coast. At the same time it cannot be denied that the experience of it goes, is associated
tions of place. Collas thinks that

¹ Surg. Rev., l. c.

he can venture to say, from his own observations and from what has been recorded of the sepoys in the Madras Army, that not a single case of it has developed in anyone away from his home.

§ 242. MOSTLY IN HINDU MALES IN THE PRIME OF LIFE.

Of unmistakeable significance in the pathogenesis is individual predisposition, depending on race, age, and sex. During the forty years that the Anglo-Indian profession has been observing the disease closely, not a single case of it has been seen in a European or in a Eurasian (half-breed). By far the most of the cases are in Hindus; among Mohammedans, forming, no doubt, the minority of the native population, it is rare. It is further worthy of note that Madura foot is almost confined to persons in the prime of their age, from twenty to twenty-five years; it is very rare under that age, and rarer still in old age. Again, by far the most of the cases recorded hitherto have been in the male sex; Carter estimates the ratio of males to females as ten to one, which corresponds on the whole with the data of Eyre, Colebrook, Minas and other authorities. It should be kept in mind, however, that Hindu women, for domestic and religious reasons, come under medical treatment not so less than the men. Although no case of Madura foot among the natives is altogether exempt from the fungus-idea, the same being found in well-to-do persons such as merchants and physicians, as well as among artisans, labourers and the poor, yet there is most of it in the lower ranks, and particularly among the peasantry. That is the explanation of the cases in the hospitals of Calcutta, Madras and Bombay being almost entirely derived from the country around.

§ 243. ITS PARASITIC NATURE: VARIOUS

Although there is still much difference the nature and mode of origin, or even it is now generally admitted that

regarded as an absolutely peculiar malady, without the slightest connexion with other morbid processes such as scrofula, tuberculosis, syphilis, or leprosy, which lead to the same sort of diseased products. Least of all is it connected with elephantiasis, although, as we have seen, it was much confused with that disease in former times; nor has it anything in common with the "mal perforant du pied" first described by Nélaton, which always starts from the tarsal bones.

Ballingal, one of the best authorities on Madura foot, was the first to describe the malady as a *parasitic process*, or as the result of a fungus penetrating the foot and growing there. He was afterwards joined in that opinion by Bidie; but the doctrine has found its most vigorous defender in Vandyke Carter, who stated in his very first paper on the subject (1861) that he had found in the diseased tissues a filamentous fungus, with mycelium and gonidia, and appended a letter from Berkeley, the well-known writer on Cryptogamic Botany, to the effect that he had examined preparations sent to him by Carter, and had detected the presence in them of a species of mould not known to him before, which he named, in honour of its discoverer, *Chionyphe Carteri*. Further researches have supplied Carter with additional evidence in support of his view, which he has brought forward in various writings from 1862 to 1874. His doctrine soon found a very decided opponent in Coquerel, who had examined a specimen sent to Paris, and had failed to discover a single trace of fungus in it; on the other hand, he was convinced that the things which Carter had taken for pieces of fungus were nothing but broken-up masses of tissue. In 1870 the question came before the Pathological Society of London. The first to give an opinion upon it were Moxon and Hogg,¹ who declared, after examining a specimen, that the fibrous masses in it had certainly the characters of a filamentous fungus, but that, if it really were an affair of a fungus, the latter had probably not penetrated the tissues until they were dead. An opinion by Bristowe² a year later, after examination of a new specimen,

¹ 'Trans. Path. Soc.' 1870, xxi, 411.

² *Ib.*, 1871, xxii, 320.

was more favorable to Carter's view; he was able to confirm that author in every point, but he was not clear about the species to which the fungus belonged, nor could he say for certain whether it was the cause of the disease or merely a consequence. Hogg¹ also, after examining a second specimen sent to him from India, came to the conclusion that there was a fungus in the tissues; but he goes on to say: "So far as I am able to offer an opinion on the nature of this remarkable disease, mycetoma, I may venture to say that, from the relatively small proportion of the fungoid filaments found in specimens I have examined, I believe the fungus must be regarded as a secondary product—one which may greatly aggravate the disease, but cannot be thought to originate it."

Berkeley subsequently adopted the view that the parasite did not invade the tissues until they had become diseased,² thereby modifying his original conclusion to a considerable extent. Lewis and Cunningham, however, denied that there was a fungus in mycetoma at all, and pronounced the matters taken for fungoid elements to be detritus of the tissues, globules of fat, concretions of pigment, and the like. In 1874 Carter brought out a monograph 'On Mycetoma or the Fungus Disease of India,' which contains an exhaustive discussion of the subject; and in that work, as well as in an article of the same date,³ he endeavours to meet and overcome the objections that had been raised against his doctrine of the parasitic nature of the malady.

"What affection of the skin," he asks, "shows small sinuses discharging peculiar granules or particles, such as we here find? or what can that affection be which, commencing in the skin, extends through the entire thickness of the foot, converting it into a globular mass; and yet having no other pathological sign but very numerous openings, shedding a thin discharge, frequently if not at all times containing distinct particles comparable to small seeds, as of the poppy, or to clusters of the ova of fishes; or, if of black colour and hard, comparable to grains of gunpowder or black peas? And all the time the patient remains free from constitutional irritation, and in fair health; he is in appearance neither strumous nor syphilitic; he has no marks of similar disease or any disease in other parts of the body;

¹ *Ib.*, 1872, xxiii, 294.

² *Med. Press and Circular*,⁴ 1876, Dec., p. 465.

³ *Lancet*,⁵ l. c.

none of his family are in like manner affected; and on the tumefied foot being amputated, his health, if depressed, quickly rallies. Examination being made of the excised member, a very peculiar tunneling, as it were, of the tissues is noticed, and an abundant growth of bodies like to, but of larger size than those discharged at the terminations of the cavities and channels lodging and isolating them while in the foot; and besides, nothing more is seen except, perhaps, such swelling or degenerative change of the normal tissues as might naturally attend the prolonged presence and constant advance of a foreign body within their midst." . . . "I shall not readily forget the first occasion," he says in another passage, "when, by bisecting a recently amputated foot, the large, firm black masses came into view, located in cavities interspersed amongst the tissues, into which they accurately fitted, and whence they could be readily lifted out. On their removal it became further apparent that only a simple membrane separated them from the normal tissue, whether of bone or fibrous tissue, in near contact with them; and next were noticed the canals or tunnels leading from these cavities towards the surface of the skin, lined with the same membrane, and also containing in abundance black granular particles, evidently of the same nature as the larger impacted masses. I saw no morbid deposit, or marks of inflammatory process in addition to this foreign growth, no caries of joints, no fleshy growth or tumour of any kind, and, in short, no sign of a pre-existing or accompanying local disease upon which the parasite might have been engrafted." And again: "Let me add, that in order of time, the fungi are to be seen at the moment when a sinuous opening is formed, and the latter seems to be produced for the purpose of giving exit to the particles."

Taking due account of all these facts, there can be no longer any doubt of the presence of a parasitic fungus in mycetoma. But the questions remain:—(1) Whether the parasite is the cause or the consequence of the disease, that is to say, whether the disease is produced by its invasion, or whether it had found its way into the focus of disease only after the soft parts of the foot were destroyed, or possibly not until after the foot was amputated; and (2) if the fungus must be regarded as the true cause, how does it find its way into the skin? Carter's later writings, and the result of an inquiry lately made at Brest by Corre on a specimen of mycetoma (published in an appendix to the posthumous work of Collas, which he edited), place it beyond doubt, in my opinion, that the disease is a parasitic one in the stricter sense of the term: that is to say, it is to be regarded as a result of the penetration of fungus-spores, which develop among the tissues of the foot (or hand) and

cause the destruction of them. But, as regards the second point, Carter's view that the spores enter the skin through the tubes of the sweat-glands would appear to be not so well established as the view held by some other Anglo-Indian surgeons, and more recently by Corre, that the invasion takes place through wounds of the skin, which need be of only trifling extent. The following interesting remarks are by Hogg, who, as we have seen, expressed himself with some reserve on the parasitic nature of the disease :

"As to the way in which the spores of a fungus may enter a wound, I would offer the following explanation in the case before us :—The patient some six months before presenting himself at the Rajkote Hospital (Bombay) struck his foot against a sharp stone, and cut it deeply. The cut soon healed and was apparently forgotten ; a few months afterwards a "gnawing" pain attracted attention, and an abscess formed, to which poultices were applied ; and then, on a careful examination, small blackish bodies were seen. It is, therefore, quite probable that the spores or filaments of a leptothrix or parasitic smut were forced into the wound, or conveyed by the poultice, at the time of the first accident."

The sequence of events in this case, taken along with the accounts given by Carter and others of the first signs of mycetoma and of its further developments, make Hogg's scepticism as to whether the fungus means cause or consequence, to seem somewhat exaggerated. Moreover, the idea of the parasite entering at wounds of the skin, finds material support in the fact mentioned above, that mycetoma is found almost exclusively among Hindus, and mostly among the peasantry, who do not wear any substantial covering on the feet, are therefore liable to have them wounded by stones, thorns, prickly plants and the like, and are notoriously often injured in that manner.

Nothing is known of the existence of the parasite outside the human body. Carter has searched for it in vain in the "cotton soil" which has been suspected. Assuming the legitimate hypothesis (as I think it is) of the parasitic nature of mycetoma to be verified by further investigations, we should be naturally driven to assume that the species of fungus is one peculiar to India, and in this explain the limitation of the disease to a few in that country.

LIST OF WRITERS ON MADURA FOOT.

Ally, *Indian Med. Gaz.*, 1876, xi, 298 (report of one case). Atchison, *Indian Annals of Med. Sc.*, Sept., 1861, 517.

Bainbridge, *Transact. of the Bombay Med. Soc.*, 1883, iii, ser. ii, 32 (one case). Ballingal, *ib.*, 1855, new series, ii, 273. Bazunjee Rustomjee, *ib.*, 1862, new ser., vii, app. xiii (several cases). Berkeley, *ib.*, 1869, new ser., ix, app. xxxiv, and *Med. Press and Circular*, 1876, Decr., 465. Bidie, *Madras Quart. Journ. of Med. Sc.*, 1862, Apr., 322. Bristowe, *Transact. of the Pathol. Soc.*, 1871, xxii, 320.

Carter, H. J., *Transact. of the Bombay Med. Soc.*, 1862, new ser., vii, app. iii. Carter, Vandyke, *ib.*, 1861, new ser., vi, 104 (The Fungus Disease of India, Bombay, 1861); *ib.*, 1862, vii, 206; *ib.*, 1863, new ser., viii, app. xxvi; *Brit. and For. Med.-Chir. Rev.*, 1863, July, 198; *Transact. of the Pathol. Soc.*, 1864, xv, 251; *Transact. of the Bombay Med. Soc.*, 1869, app. xlvii; *Transact. of the Pathol. Soc.*, 1873, xxiv, 260; *Indian Med. Gaz.*, 1874, ix, 220; *Lancet*, 1874, July, 44, 113; On Mycetoma or the Fungus Disease of India, Lond., 1874. Cleghorn, *Indian Med. Gaz.*, 1874, ix, 260. Collas, *Leçon sur la dégénération endémique des os du pied*. Pondicherry, 1861, and in *Arch. de méd. nav.*, 1883, Févr., 81, Mars, 204 (edited after the author's death by Corre). Coquerel, *Gaz. méd. de Paris*, 1866, 504.

Downie, *Ind. Med. Gaz.*, 1873, viii, 321 (also in *Med. Press and Circular*, 1874, Jan., 28). Dymock, *ib.*, 1881, xvi, 56.

Eyre, *Indian Annals of Med. Sc.*, 1860, Apr., 513.

Fayrer, *Clinical and Pathol. Observations in India*, Lond., 1873, 637. Fox, *Transact. of the Pathol. Soc.*, 1870, xxi, 411; 1871, xxii, 320; *Lancet*, 1876, Jan., 190.

Hogg, *Med. Times and Gaz.*, 1871, July, 93; *Transact. of the Pathol. Soc.*, 1872, xxiii, 294. Holmestead, *Transact. of the Bombay Med. Soc.*, 1870, new ser., x, 304.

Lewis and Cunningham, *The Fungus Disease of India* (Append. to the XI Report of the Sanitary Commissioner with the Government of India), Calcutta, 1875 (also in *Indian Annals of Med. Sc.*, 1876, 354 ff).

Miller and McDowall, *Transact. of the Bombay Med. Soc.*, 1869, new ser., ix, app. xxxii. Minas, *Indian Annals of Med. Sc.*, 1806, Nov., 316, 1861, Apr., 521; *Indian Med. Gaz.*, 1868, iii, 107, and 1869, iv, 140. Moore, *ib.*, 1867, ii, 269; 1873, viii, 282.

Newman, *ib.*, 1874, ix, 322.

*Elephantiasis.**(Barbadoes leg, Cochin leg, Bucnemia Indica, Pachydermia.)*

§ 244. CONFUSION WITH LEPROSY, SOLELY OWING TO THE NOMENCLATURE.

Among the morbid forms belonging to the group of hypertrophies of the skin, elephantiasis has a special interest from the geographical point of view. In the history of this disease, as in that of many others, the terminology has played an unfortunate part, having led to confusion of ideas and erroneous nosological views which had not been got rid of altogether until quite recent times.

The term "elephantiasis" is first met with in the treatise of Celsus,¹ who gives under that title a description, very superficial no doubt, but at the same time unmistakeable, of leprosy, and adds the remark that it was the Greek writers who had used the word *ἐλεφαντίασις* for it. Archigenes,² Aretaeus,³ Galen⁴ and others follow that connotation in what they have written concerning "elephantiasis." From Galen's various definitions of the term, to be found here and there in his writings,⁵ it follows, however, that the disease which we have here to consider was not unknown to the authors of that period; they had, in fact, included both diseases, leprosy and elephantiasis, under one head; or they had taken them to be divergent forms of one and the same morbid process. During the middle ages the same error became more firmly rooted, for no other reason than the unfortunate choice of a name; the Arabian school⁶ had described very

¹ 'De medicina,' lib. iii, cap. xxv.

² In Aëtius, 'Compendium,' sermo xiii, cap. cxx, Basil, 1533, ii, 414.

³ 'De causis et signis diuturnor. morbor.,' lib. ii, cap. xiii.

⁴ 'De morbor. causis,' lib. vii, ed. Kühn vii, 29; 'Liber de tumoribus præter naturam,' cap. xiv, e. c. vii, 727; 'De medendi methodo ad Glauconem,' lib. ii, cap. xii, e. c. xi, 140.

⁵ 'Introductio,' cap. xiii, ed. cit., vol. xiv, 756; 'Deff' cit., xix, 428.

⁶ See particularly Rhazes, 'De re medica ad regem

exhaustively the disease that corresponds to "elephantiasis" in the modern sense, under the name of "dâ-al-fil" (elephantine disease), and the Arabic word was rendered as elephantiasis in the Latin versions of their writings. The confusion came to a still greater pass when the translators of Arabic medical works rendered the word "judam," or "dchudam," which the Arabians had used in their not less excellent descriptions of leprosy, by the word "lepra," taken from the medical terminology of the Greeks and restricted in its use up to that time to various exanthemata, especially of the scaly sort; and in that way there was introduced a new obscurity into the conception of leprosy. This confounding of leprosy with elephantiasis has continued through all subsequent times, or, strictly speaking, until the beginning of the present century. No doubt a few sagacious practitioners of the seventeenth century¹ saw the mistake and endeavoured to correct it; and about the middle of the eighteenth century there appeared the excellent works on elephantiasis by Hillary, Hendy and Rollo, and some time after the treatise of Alard,² which served to place that disease on a scientific footing. But the two diseases were not respectively freed from all obscurity until the writings of Duchassaing on elephantiasis, and those of Danielssen and Boeck on "spedalskhed" or leprosy.

The history of elephantiasis, accordingly, cannot be followed farther back than the time of the Arabian school; and even for the later mediæval period as well as the sixteenth and seventeenth centuries, the medical literature gives us but little information as to the extent of the malady in those times. It is not until we come to the eighteenth century that we find trustworthy accounts, in considerable numbers, testifying to the existence of elephantiasis. These, along with the modern accounts of medical topography, afford us a safe means of estimating the distribution-area of elephantiasis; and if we make allowance for the scantiness of the

scil. and lib. divisionum i. cap. cvii, Basil, 1544, 274, 418; Haly Abbas, *79.

¹ractie,* lib. iv, cap. iii, Lugd., 1523, 976, 196b;

²act. i, cap. xvi, Venet., 1564, i, 952.

Fract. de elephantiasi, Genev., 1620, 6.
ris, 1809.

notices on disease from earlier times, they warrant us in assuming that it had been the same in all ages, or, that there had been no considerable fluctuations in its amount from century to century.

§ 245. ENDEMIC SEATS OF ELEPHANTIASIS.

Elephantiasis has been seen in all parts of the world. But as an endemic it exists only in somewhat circumscribed areas, all of them within tropical or subtropical latitudes. Even in these its distribution is not uniform, but mostly in concentrated foci, with their immediate neighbourhood free from it or subject only to occasional cases such as may occur anywhere.

In the Eastern Hemisphere, some of its chief seats are the southern regions of the Asiatic continent and islands: such as the coast of *Arabia*,¹ many parts of India, Ceylon, the Malay Archipelago, some districts of Further India, and the southern and south-eastern coasts of China. In *Syria* and in *Japan*² the disease is not so common, although there is a good deal more of it than in Europe.

In *India*³ elephantiasis is especially frequent along the littoral of Lower Bengal:⁴ thus, in the district of Hooghly, according to Wise, there are few families in which one or more individuals do not suffer from it; it is also common along the swampy littoral of Orissa,⁵ as in Balasore, Cuttack

Courbon, 'Observ. topogr. et méd. rec. dans un voyage à l'isthme de Suez,' Paris, 1861, p. 69.

¹ Maget, 'Arch. de méd. nav.,' 1877, Mai, 378; Godet, 'Étude sur l'hygiène au Japon,' Par., 1880, 59.

² As general authorities, see Annesley, 'Researches into the Causes of the more prevalent Diseases of India,' Lond., 1840, 102; Eedaille, 'Lond. Med. Gaz.,' 1850, xi, 449; Morehead, 'Clinical Researches on Disease in India,' Lond., 1856, ii, 676.

³ Breton, 'Transact. of the Calcutta Med. Soc.,' ii, 245; Evans, ib., iv, 245; Brander, ib., 381; Wise, ib., vii, 156; and 'Dublin Quart. Journ. of Med. Sc.,' 1858, Aug., 156; Twining, 'Clinical Illustr. of the more important Diseases of Bengal,' Calcutta, 1835, ii, 427; Fayrer, 'Edinb. Med. Journ.,' 1862, Febr., 718; Palmer, in Fox and Farquhar, 'On Certain Endemic Skin India,' &c., Lond., 1876.

⁴ Sterling, 'Orissa,' &c., Lond., 1846; Shortt, '1858, Jan., 1; Richards, ib., 1873, Jan., 343.

and Puri. It is found also in Pondicherry,¹ and at a few places on the Coromandel coast,² especially in the district of Tanjore³ at the extremity of the peninsula; but most of all on the Malabar coast,⁴ which has long had an evil repute for it. It occurs there principally in the districts of Travancore and Cochin,⁵ in which, according to Underwood's official report,⁶ one-tenth of the whole population would seem to be subject to it, and, according to Waring, 2133 cases of elephantiasis have been counted in a locality with 48,600 inhabitants. In the Deccan and in Upper India, it occurs much less frequently, although there also small endemic centres exist in certain localities, such as Ramghar, Chota Nagpore, and Sirgooja, as well as in the district of Tirhoot. The frequency of elephantiasis in *Ceylon* had been reported by early writers, such as Kämpfer⁷ and Alard; in that country also, its headquarters are on the coast, especially the southern districts between Colombo and Matura.⁸ In the *East Indies*, the Lampong country of Sumatra,⁹ Banka,¹⁰ the Nicobars¹¹ and the Philippines¹² are the regions most severely affected, the malady being less often seen in other islands, such as Java¹³ and Amboina.¹⁴ From Further India there are notices of it in Penang and among the Anamese population of Cochin China.¹⁵ In *China*¹⁶ there is

¹ Huillet, 'Arch. de méd. nav.,' 1868, Janv., 5; Auboeuf, 'Contrib. à l'étude d'hygiène et des maladies dans l'Inde,' Par., 1882, 65.

² Voigt, 'Bibl. for Laeger,' 1834, i, 358; Montgomery, 'Madras Quart. Journ. of Med. Sc.,' 1863, Apr., 345.

³ Ross, *ib.*, 1868, Oct., 273.

⁴ Cleveland, *ib.*, 1863, Jan., 26.

⁵ Day, *ib.*, 1860, July, 37, 1861, April, 332, 1862, Jan., 24; Waring, 'Indian Annals of Med. Sc.,' 1858, Jan., 1.

⁶ Quoted by Annesley.

⁷ 'Amoenitates exoticæ,' Fasc. iii, obs. 8.

⁸ Marshall, 'Notes on the Med. Topogr. of the Interior of Ceylon,' Lond., 1821, 225.

⁹ v. Leent, 'Arch. de méd. nav.,' 1872, Janv., 22.

¹⁰ Epp, 'Schilderungen aus Holländisch-Ostindien,' Heidelb., 1852, 172.

¹¹ Steen-Bille.

¹² Mallat.

¹³ Hermann, 'Darstellung der Krankh. in den Tropenländern,' 210; v. Leent,

¹⁴ 'monde,' Par., 1829, 98.

Avril, 279.

¹⁵ 1846, 24; Friedel, 'Beitr. zu

most of it in the southern and south-eastern coast districts, such as Canton, Amoy, Chusan and Shanghai.

Certain of the archipelagoes of *Polynesia* are among the worst regions of the globe for elephantiasis: such as the northern part of New Caledonia,¹ the Tonga² and Fiji³ groups, the Samoa⁴ group (where, according to Turner, 50 per cent. of the natives suffer from it, or, as Lacroix says, one meets a person with elephantiasis at every step of the road), Wallis Island,⁵ the Society Islands⁶ (especially Tahiti and Raiatea), and the Gambier group.⁷ It is less common in the Marquesas⁸ and in the Hawaiian Islands.⁹ In Australia, as well as in New Zealand, it is not endemic.

A scarcely less classical soil for the disease is afforded by many equatorial and subtropical regions of the African continent and islands adjoining. That applies especially to *Réunion* and *Mauritius*,¹⁰ the *Seychelles*,¹¹ *Madagascar* and

Kenntniss des Klimas und der Krankh. von Ost-Asien,' Berl., 1863, 123; Lockhart, 'Edinb. Monthly Journ. of Med.,' 1846, March, 164; Armand, 'Gaz. med. de Paris,' 1861, 263; Dudgeon, 'Glasgow Med. Journ.,' 1877, July, 327; Rochefort, 'Arch. de méd. nav.,' 1879, Avril, 241.

¹ Vinson, 'Topogr. méd. de la Nouvelle-Calédonie,' Par., 1858; de Rochas, 'Essai sur la topogr. hyg. et méd. de la Nouvelle-Calédonie,' Par., 1860, 29; account in 'Arch. de méd. nav.,' 1866, Janv., 18; Bourgarel, 'Mém. de méd. milit.,' 1866, Avr., 338; Boyer, 'Arch. de méd. nav.,' 1878, Sept., 231.

² Bennett, 'Narrative of a Whaling Voyage round the Globe,' Lond., 1840, i. 150.

³ Messer, 'Arch. de méd. nav.,' 1876, Nov., 321.

⁴ Turner, 'Nineteen Years in Polynesia,' &c., Lond., 1861, 536; 'Glasgow Med. Journ.,' 1870, Aug., 502, and ib., 1882, June, 401; Lacroix, 'Arch. de méd. nav.,' 1866, Jan., 29; Königer, 'Arch. für klin. Chir.,' 1879, xxiii, 413; Heflinger, 'Boston Med. and Surg. Journ.,' 1882, Aug., 154.

⁵ Raynaud, 'Arch. de méd. nav.,' 1876, Août, 248; Clavel, ib., 1884, Sptbr., 196.

⁶ Lesson, l. c., 51; Ref. in 'Arch. de méd. nav.,' 1865, Août, 248; Oct., 293; Saville in Fox and Farquhar, 'On Endemic Skin Diseases, &c.,' Hercouet, 'Études sur les malad. des Européens aux îles Tahiti,' Par., 1880, 67; Clavel, l. c.

⁷ Lesson, 'Voyage aux îles Mangareva,' Rochefort, 1845.

⁸ Clavel, Hercouet, ll. cc.

⁹ Bennett, 'Lond. Med. Gaz.,' ix, 629; Hercouet, l. c.

¹⁰ Chapotin, 'Topogr. méd. de l'île de France,' Par., 1812, 71; Aréna, 'Gaz. Méd. de Paris,' 1858, 22, 34; Vinson, 'Arch. de méd. nav.,' 1877, Juill., 22; Pellissier, 'Considér. sur l'étologie des maladies les plus cor,' Par., 1883, 34.

¹¹ Allan, 'Edinb. Monthl. Journ. of Med.,' 1841, Aug.

Nossi-Bé,¹ the *Mozambique*² and *Zanzibar*³ coasts; also the whole coast of *Upper Guinea*,⁴ including the Gaboon and Cameroons country, and the Benin Coast, Gold Coast, Spice Coast and Sierra Leone, as well as *Senegambia*.⁵ It is true also of the parts of *Tunis*,⁶ *Algiers*⁷ and *Egypt*⁸ nearest to the Mediterranean (particularly Rosetta, Damietta and other places in Lower Egypt); and of the swampy valleys of the interior of *Abyssinia*.⁹ In the upper valley of the Nile (Nubia and neighbouring countries of the negro), elephantiasis would seem to be quite unknown;¹⁰ on the other hand there are accounts of its endemic occurrence at some places in the Greater Soudan, such as *Bornou*,¹¹ *Segu Sicorro*¹² and *Ogoué*.¹³ In recent papers relating to the Cape, I have found no confirmation of Berncastle's¹⁴ statement that elephantiasis is often met with there.

Under the same circumstances of locality we find the

¹ Guiol, 'Arch. de méd. nav.,' 1882, Nov., 331; Deblenne, 'Essai de geogr. méd. de l'île Nossi-Bé,' Par., 1883, 233-4.

² Roquette, 'Arch. de méd. nav.,' 1868, Mars, 161.

³ Semanne, 'Essai d'une topogr. méd. de l'île de Zanzibar,' Par., 1864; Burton, 'Zanzibar, its City, &c.,' Lond., 1872; Lostalot-Bachoué, 'Étude sur la constitution phys. et méd. de l'île de Zanzibar,' Par., 1876.

⁴ See Oldfield, 'Lond. Med. and Surg. Journ.,' 1835, Nov., 403; account in 'Boston Med. and Surg. Journ.,' 1843, June, 293; Clarke, 'Transact. of the Epidemiol. Soc.,' 1860, i, 106; Moriarty, 'Med. Times and Gaz.,' 1866, Dec., 663; Abelin, 'Étude sur le Gabon,' Par., 1872, 31.

⁵ Berville, 'Remarques sur les maladies du Sénégal,' Par., 1857; Thaly, 'Arch. de méd. nav.,' 1867, Sept., 187; Rey, ib., 1877, Juin, 401; Borius, ib., 1882, Mai, 375.

⁶ Ferrini, 'Saggio sul clima di Tunisi,' Milano, 1860, 247.

⁷ Guyon, 'Bull. de l'Acad. de méd.,' 1852, 989; Bertherand, 'Méd. et hygiène des Arabes,' Par., 1855; Armand, 'Méd. et hygiène des pays chauds, &c.,' Par. (1860), 423.

⁸ Röser, 'Ueber einige Krankh. des Orients,' Augsb., 1837, 52; Pruner, 'Die Krankh. des Orients,' 325; Reyer, 'Wochenbl. zur Zeitschr. der Wiener Aerzte,' 1855, Nr. 10; Godard, 'Egypte et Palésthine,' Par., 1867; Mahommed-Aly, 'De l'éléphantiasis des Arabes,' Par., 1869; Mayer, 'Arch. de méd. nav.,' 1869, Mai, 325; Vauvray, ib., 1873, Sept., 161; Friocourt, ib., 1884, Août, 90.

⁹ Larrey, 'Mémoires de Chirurgie Militaire,' Germ. ed., Lpz., 1813, i, 183; Petit in Lefèvre 'Voyage.'

¹⁰ Reyer, l. c.

¹¹ Nachtigal, 'Sahara und Sudan,' Berl., 1879, 1881, ii, 469.

¹² Quintin, 'le Soudan,' Par., 1869, 43.

¹³ 'occidentale,' Par., 1880, 37.

disease widely endemic in the Western Hemisphere: as in the coast regions of *New Granada*, *Venezuela*¹ and *Peru*;² in those parts of *Brazil*³ that are mostly tropical in character; on the coast and marshy levels of *Guiana*;⁴ in many islands of the *West Indies*⁵ such as Barbadoes (where the first scientific descriptions of it by Hillary, Hendy and Rollo were written, and where it is still as common as it was then),⁶ Martinique, Guadeloupe, Trinidad, St. Vincent and St. Bartholomew; as well as on the Gulf Coast of the *Central American States*⁷ of Nicaragua, Costa Rica and Panama, and of *Mexico*.⁸

The countries last named form the northern limit of the endemic occurrence of elephantiasis in the Western Hemisphere. In the United States and in Canada it is seen only in sporadic cases.⁹ Nor is it more than sporadic on the Continent and insular territories of Europe. It is impossible

¹ Duchassaing, 'Arch. gén. de méd.,' 1854, Oct.—Dec., 1855, Jan.

² Smith, 'Edinb. Med. and Surg. Journ.,' 1840, April, 340; Tschudi, 'Oester. med. Wochenschr.,' 1846, 472.

³ Rego, 'Revista med. flumin,' 1840, April; Plesants, 'Amer. Journ. of Med. Sc.,' 1842, July, 88; Lallemand, 'Schmidt's Jahrb. der Med.,' 1846, Bd. 50, 86; Sigaud, 'Du climat et des malad. du Brésil,' 379; Rendu, 'Étude topogr. et méd. sur le Brésil,' Par., 1848, 74; St. Hilaire, 'Voyage aux sources du Rio Negro, &c.,' Par., 1848, ii, 50; Dundas, 'Sketches of Brazil,' Lond., 1852, 355; Plagge, 'Deutsche Klinik,' 1857, 'Monatsbl. für Stat.,' Nr. 10; da Silva Lima, 'Arch. de méd. nav.,' 1880, Mai, 366.

⁴ Bascome, 'Lancet,' 1846, April; Dalton, ib., 1846, Oct.; Blair, 'Account of the last Yellow Fever Epidemic,' Lond., 1850, 21 (British Guiana); Duchassaing, l. c. (Cayenne); Hasselaar, 'Beschr. der in de Kolon. Suriname voork. Elephantiasis en Lepros,' Amsterd., 1835; Hille in Casper's 'Wochenschr. für Heilkde.,' 1841, 33; Ter Beek, 'De elephantiasis Surinameas,' Lugd. Batav., 1841; van Leent, 'Arch. de méd. nav.,' 1880, Nov., 419 (for Surinam).

⁵ Hillary, 'Obs. on . . . the Epidem. Diseases in Barbadoes,' Germ. ed., Lps., 1776, 361; Hendy, 'Treatise on the Glandular Disease of Barbadoes,' Lond., 1784; Rollo, 'Remarks on the Disease lately described by Dr. Hendy, &c.,' Lond., 1785; Thomas, 'Transact. of the Med.-Chir. Soc.,' 1815, vi, 73; Savréry, 'De la fièvre jaune,' Napl., 1809, 31; Leurén, 'Svenska Läk. Sällsk. Handl.,' 1815, ii (1), 176; Levacher, 'Guide méd. des Antilles,' Par., 1840, 269; Duchassaing, l. c.; Brassac, 'Considér. pathol. sur les pays chauds,' Montp., 1863; Moulin, 'Introd. à la pathol. de la race Nègre dans les pays chauds,' Par., 1866, 23; Ruz, 'Arch. de méd. nav.,' 1869, Août.

⁶ Jackson, 'Bost. Med. and Surg. Journ.,' 1867, July, 446.

⁷ Bernhard, 'Deutsche Klinik,' 1854, Nr. 8; Dupl, 1864, Nov., 374; Duchassaing, l. c.

⁸ Duchassaing, l. c.

⁹ Carnochan, 'New York Journ. of Med.,' 1852

to say for certain whether there are any considerable differences in the number of cases between the several European countries in higher or lower latitudes.

In Greece it is very rarely met with;¹ Rigler has seen it more frequently in *Turkey*;² in the south of *France* also,³ and in *Lisbon*,⁴ and southern *Spain*⁵ it would appear to be relatively common; but, as Gregory points out, the patients may be in great part such as had acquired elephantiasis in the East. In some parts of the south of *Ireland*⁶ and on the east coast of *Scotland*⁷ an unusual number of cases have been seen, but unfortunately we have no statistics whereby to measure the prevalence of the disease in those districts in comparison with the amount of it in other parts of the United Kingdom and in the neighbouring countries.

§ 246. FAVOURED BY HEAT AND MOISTURE.

The endemic area of elephantiasis reaches, as the foregoing sketch shows, from about 35° N. to 25° S. in the Eastern Hemisphere, and from 25° N. to 30° S. in the Western. As an endemic, therefore, the disease is decidedly tropical in character; it would seem to be associated with definite conditions of *climate*, most of all with *high temperature* and much *atmospheric moisture*. In respect of the latter, a circumstance that we shall have to consider later on, comes quite specially into account: namely, that in nearly all the regions subject to elephantiasis, including even those where the malady is merely sporadic, the belts of coast or the shores of large rivers, or whatever localities have much moisture in the soil and therefore a high degree of moisture in the air, are its principal seats; on the other hand many places in the

¹ Stephanos, 'La Grèce, &c.,' Par., 1884, 546.

² Rigler, 'Die Türkei, &c.,' ii, 98.

³ Faure, 'Souvenirs du Midi, &c.'

⁴ Trogher, 'Briefe während einer Reise durch Istrien, &c.,' Triest, 1855, 157.

⁵ Gregory, 'Lond. Med. Gaz.,' 1828, ii, 79; Hennen, 'Sketches of the Med. Topogr. of the Mediterranean,' Lond., 1830, 119.

⁶ 'Dubl. Hosp. Rep.,' 1827, iv, 62; Bellingham,

quoted in Esmarch and Kulenkampff,
p. 15.

tropics celebrated for their dry climate enjoy a notable immunity from it, an exemption of which we find instances in the distribution of the disease in Egypt, Abyssinia, Algiers, Ceylon, India and Brazil.

"It is a striking thing," says Lallemand, "that I have not observed a single case of elephantiasis on Do Sal and Boa Vista, two islands of the Cape Verde group in 15° N., which are much nearer the equator than Rio in 22° S., and have on the average a much hotter climate. I spent twelve days in them, and was consulted by a large number of patients, principally syphilitic, there being no resident medical man; and if elephantiasis had been flourishing there, I should certainly have often seen its obvious effects. But the air on these barren, sandy and rocky saline islands, with a soil that is bare and stripped of almost every kind of vegetation, and responds drearily in mid-ocean to the Sahel opposite, is in the highest degree dry, and often there is no rain the whole year long."

§ 247. LARGELY DUE TO ALTERNATIONS OF HEAT AND COLD
ACTING ON THE LEGS.

Regarding the effects of weather in producing the disease, we have further to note that the disease begins, or has its periodical exacerbations, mostly in those seasons of the year which are distinguished by great *vicissitudes of temperature*, that is to say, in the cold season or in the transition-periods corresponding to the spring and autumn of the temperate zone. It is on that ground that many observers, such as Wise, Day, Richards and others in India, Bennett and Lesson in Polynesia, Pruner, Preyer and others in Egypt, Hendy and Duchassaing in the West Indies, Hillé and Bascome in Guiana, and Dundas in Brazil, are inclined to think that *chill* is important as an occasion or an exciting cause of the malady.

"The Hindoos," says Wise, "are frequently exposed to great vicissitudes of temperature, more especially towards the end of the rains and during the cold months, which act as the exciting cause. During the rainy season the nights are frequently calm and moist, and feel excessively sultry; so as to induce the natives to leave their houses open, and have seldom any aperture but the door to allow air, to sleep upon the damp ground or in an open place. A single thin cotton cloth forms their only dress."

from the ground, and the cold unhealthy night dew. At these seasons of the year the wind often changes its direction suddenly, and is accompanied with rain, which sometimes, in a short time, depresses the mercury 20° , and blows over persons so exposed, with the skin relaxed and covered with perspiration. In other cases, the fatigued and heated body of the Hindoos is chilled by bathing, and retaining the wet cotton covering on their loins in returning to their homes, often at considerable distances; which produces a rapid evaporation, and consequently a considerable degree of cold. In other cases the disease would appear to be produced by having the feet long immersed in water when the body is exposed to the great heat of the sun; as in preparing the rice fields, transplanting the rice plant, or working in wet mud for building houses."

Hillé says: "The first and most important (exciting) cause would be chill. Owing to the copious fall of rain on a clammy soil of clay during the rainy season, and even at other times, the ground is always wet and naturally cooler than the atmosphere, or than in places under cover. All the slaves have to go barefoot, and most of the creoles do the same of their own accord. When the lower-class creole or the negro is within doors, and with few or no apertures to admit the air, it is his constant practice to sit before a blazing fire, with his legs stretched out to the heat. They naturally get scorched by the fire acting on them in a temperature otherwise high. How easy, then, for chill to follow, and particularly a slight degree of rheumatic inflammation of the absorbents, lymphatic glands and subcutaneous tissues, when the individual quits his fire and goes out in the open air to puddle in the cold and wet clay ground!"

§ 248. PECULIARLY NARROW LIMITATION OF THE ENDEMIC SPOTS.

In estimating the importance of climatic influences on the genesis of elephantiasis, we ought not to disregard the fact that the number of cases is by no means in proportion to the height of the temperature and the amount of moisture in the air and soil; that regions with a very high temperature, such as Upper Egypt and Nubia, are little, if at all, subject to the malady, whereas districts in their immediate vicinity, such as Lower Egypt, Tunis and Algiers, although they have a much milder climate, are principal seats of the
the tropics which are actually
Barbadoes, are intense foci
a very damp climate,

such as parts of the Malay Archipelago and of the Coromandel Coast of India, have very little of it ; but most of all, that the centres of elephantiasis are, generally speaking, confined within strict limits to one or a few places within great tracts of country which are perfectly uniform in their climate throughout, the inhabitants in other parts of the affected region being either exempt from the disease altogether or but little subject to it. In Egypt it is endemic mostly at Damietta and Rosetta, while at Alexandria, Tintah, and other places in the Delta it is much more rarely seen (Godard). There are the same differences in the incidence of the disease between the various localities in the Society Islands (Saville) and in the East Indies. In some of the districts of India that are much subject to elephantiasis, we have truly classical instances of the same thing ; thus the focus of it in the district of Travancore is almost absolutely limited to a small tract of country hardly three miles broad, and separated by a narrow lagoon from the country around : more than 20 per cent. of the people living on it have elephantiasis, while there are only occasional cases in the places near, such as the capital, Trivandrum, and its immediate vicinity, with 80,000 of a population (Waring). In the district of Tanjore the disease is restricted as an endemic to the towns of Tanjore and Negapatam (being so common that Ross writes of the former : " In every street, in every lane, one is constantly meeting with the Tanjore leg in every stage of development ") ; whereas it is hardly known round about, as at Wallum only seven miles from Tanjore, or in Combaconum, Manarguddy, Myaveram, and other places.

§ 249. WET LOCALITIES MOST FAVORABLE TO IT.

All these facts seem to show that the endemic prevalence of elephantiasis is dependent on certain *conditions of locality*. Among these the chief stress is laid by most of the observers upon *dampness or swampiness of the ground* of that there are, in point of fact, a number of considerations. As we have had occa

times in sketching the distribution and in discussing the influence of climate, it is nearly always the coast and the shores of rivers that constitute the principal seats of the disease within those countries and islands where it is endemic. Day says: "Elephantiasis occurs with varying degrees of frequency along the seashores and banks of tidal rivers in India, Ceylon, and other parts of the world;" and he adds that it extends no farther than ten miles landward from the Cochin coast, decreasing towards that limit. We find the same rule fully borne out by observations made in other parts of India, such as Lower Bengal (Wise), Orissa (Shortt), and Travancore (Waring), as well as in Ceylon (Marshall), Egypt (Godard), Algiers (Armand, Bertherand), the West Indies (Rufz), Venezuela and Guiana (Hillé and Dalton), Brazil (Lallemand), and Polynesia (Bennett and Turner). The more flat and damp the ground is in a tropical or subtropical piece of country, the more suited does it seem to be for the endemic existence of elephantiasis. That rule may be deduced from the aggregate of observations before us; and it finds support in the fact that, in elevated regions with a dry soil, it is the exception to meet with any great amount of the malady.

In considering the question of what it is in that kind of soil which constitutes the disease-producing factor, we ought not to leave out of account a fact several times adverted to already: namely, that elephantiasis occurs for the most part in small and often very narrowly circumscribed spots, while the whole country around, with the same kind of soil, is exempt from the disease, at least in its endemic form; and that there are large tracts of tropical or subtropical country with a wet or swampy soil where it is quite unknown. We are accordingly driven to assume at the outset that the true cause of the malady must consist in some noxious thing, which does indeed occur principally in wet soil, but is inherent therein only under certain conditions. Touching the nature of that specifically harmful thing we have already brought forward some evidence in speaking of the *Filaria* and we shall have some interesting results of recent the present it

remains doubtful how far the conclusions drawn from these observations are relevant to the endemic occurrence of elephantiasis in general.

§ 250. EVIDENCE AGAINST ITS MALARIAL NATURE.

The predominance of elephantiasis on wet or marshy ground has given origin to a theory, supported by Esdaile, Waring, Mahommed-Aly, Turner, Dalton and Lallemand, to the effect that the malarial poison is in some way the cause of the disease: in other words, that *elephantiasis is a form of malarial sickness*. This theory would appear to find support in the supposed identity between the febrile paroxysms which often occur in the course of the disease (but by no means always), and the paroxysms of ague; but that assumption is based upon a radical error.¹ Not to mention that elephantiasis is not more common in the worst centres of malaria in Europe (such as the Tuscan Maremma and the Roman Campagna) than in any other part of that continent, the theory breaks down when we compare the wide extent of the malarious territory in lower latitudes with the isolated and closely circumscribed, although numerous, endemic spots of elephantiasis, which sometimes do not even fall within the malarious area. But the differences between the distribution of elephantiasis and that of malaria come out still more decidedly when we take smaller areas into consideration. Thus, to mention only a few of the facts, elephantiasis is rare at Tintah in the Nile delta, surrounded by rice-fields; whereas at Damietta and Rosetta, which are comparatively little subject to malaria, it is endemic. In the magistracy of Damruh (south-eastern part of Balasore, Orissa), situated close to the Bay of Bengal and forming with its swampy soil and rank vegetation one of the worst centres of malaria, elephantiasis is rarely seen, according to Richards (l.c. p. 358); whereas the population in the very next station

¹ Hendy long ago declared that it was quite inadmissible to identify the febrile paroxysms occurring in the course of elephantiasis with the periodical attacks of malarial fever; and among recent writers, Day, Richards, and others have shown how untenable that doctrine is.

of Zillah, are subject to elephantiasis in a quite especial degree, although the station enjoys a striking immunity from malarial disease. Réunion and Mauritius, which were almost entirely free from malaria down to 1866, have always been notorious as endemic centres of elephantiasis. Moreover we have to bear prominently in mind that, in the endemic seats of the latter disease, the races that suffer most from it (negroes and other coloured peoples) are the very persons who offer the greatest resistance to malaria; whereas the European residents, who are quite peculiarly subject to malarial sickness, are attacked by elephantiasis extremely seldom, their susceptibility to it rising exactly in proportion to their acclimatisation, and therefore in proportion as they gain the power to resist the action of malaria.

§ 251. ALLEGED INFLUENCE OF FISH-DIET AND OF BAD WATER.

With *insanitary conditions* the origin of the disease is unmistakeably connected. Although, in its endemic seats, no class of the people and no social rank is altogether exempt from it; still it is everywhere the poor that suffer principally, most of all the proletariat proper, who are not only less able to protect themselves against the weather than those who are better off in the matter of clothing and dwellings, but are, moreover, quite peculiarly apt to incur the disease through the effects of damp, filthy and ill-ventilated living rooms. "It must be owned," says Waring in reference to his Travancore experience, "that by far the greater proportion of those attacked were in poor circumstances and destitute of many of the necessities, small as they are, of Hindu life;" and we hear the same opinion expressed by Wise, Day, Auboeuf, and Richards for other parts of India, by Wilson for China, Turner for Polynesia, Pellissier for Réunion, Guyon for Algiers, Hartmann, Godard and others for Egypt, Levacher and Jackson for the West Indies, Dalton for Guiana, and by Sigaud and Lallemand

ses of a general kind pro-
ich are certainly to be

regarded as no more than the opportunities of the disease, there are other things in the same class of factors which have been thought to have a specific importance in the production of the morbid state. An *excessive addiction to fish-diet* used to pass current as an essential factor, the preponderance of cases on the sea coast and banks of rivers being brought into connexion therewith; and more recently Clarke (of Sierra Leone) has laid special stress on that influence. But the following fact given by Waring (l. c., p. 22) will show how slight a foundation there is for it: Of 800 patients with elephantiasis from the notorious Travancore district, whose occupation was ascertained, only 11 were fishermen subsisting almost exclusively on fish; and in a village on the coast near Kovalum, nine miles from Trivandrum, which contained 150 families almost entirely occupied with the fisheries and having hardly anything but fish to live upon, there was not a single case of elephantiasis to be seen, the disease being equally unknown in the immediate vicinity.

According to another theory, an essential factor in the malady is the use of *drinking-water rich in saline constituents or tainted by organic matters*. It was long ago stated by Kämpfer: "Mali materiam præbent fontes, non tam Malabriæ universæ, quam regni Cocinensis; sale enim corrosivo abundant (nitrum ibidem vocant), cujus acredo, sanguinis viscido juncta, partem nutriendam obstruit atque vitiat." In later times, Larrey, Wise and others have spoken of bad drinking-water as having an influence on the disease; Annesley believed that its prevalence in Cochin, if not every case of it, should be attributed to the habitual use of brackish water; Duchassaing pointed out that it was rare wherever the people drank running water, while it was common where the drinking-water was taken from tanks, ponds or stagnant pools; Waring also thinks that the use of brackish water, or water tainted by putrefying vegetable matters, plays an important part in making the disease endemic in Travancore; and, in like manner, Ross says that the only cause to be found for the endemic in Tanjore is impurity of the drinking-water: it is within fifty years that the disease has been prevalent is since the same date that the water—

from tanks befouled by sewage, the latter condition being the only one wherein the places in that district subject to elephantiasis differ from the places that are free from it. But all these data, and others like them, are too uncertain, and based on too slight a foundation to have any special importance assigned to them. There are innumerable places on the globe where brackish water is used, or water made impure by decaying vegetable matters, but no elephantiasis endemic. At the same time we should not absolutely reject the suggestion that the specific agent of the disease may be present in the water of certain localities, although it may not always constitute an impurity in the gross sense.

§ 252. MOSTLY A DISEASE OF THE NEGRO AND OTHER COLOURED RACES, OF THE MALE SEX AND MATURE AGE.

Lastly, certain *morbid states of the individual*, as well as circumstances of *age, sex* and *race*, are important for determining the incidence of the malady. Elephantiasis is extremely rare up to twenty years of age, and it is never seen under ten. The cases in the male sex, according to an approximate estimate, are five times as many as in the female. Although no family of mankind, and no nationality, enjoys perfect immunity from elephantiasis, it is the coloured races and mestizos, above all the negroes, that are subject to it to an infinitely greater extent than the white men of European or American birth. On that point there is complete agreement among the authorities for India,¹ Ceylon,² Polynesia³ (Heflinger had seen only one European with elephantiasis among 125 persons of that nationality resident in the Samoan Islands), Réunion,⁴ the Mozambique coast⁵ and Zanzibar,⁶ Nossi-Bé,⁷ Egypt,⁸ Tunis,⁹ Senegambia¹⁰ and the West Indies.¹¹ Also in the tropical parts of South America, such as Guiana, Venezuela, Brazil and Peru, the negroes and half-

¹ According to the unanimous statements of Voigt, Wise, Twining, Day, Waring, Huillet, Fayrer and others.

² Marshall.

³ Bennett, de Rochas, Hercouet, Messer.

⁴ Chapotin, Pellissier.

⁵ Roquette.

⁶ Barton.

⁷ Guisl, Deblenne.

⁸ Franer, Möser.

⁹ Ferrial.

¹⁰ Borius.

¹¹ Hillary, Hendy, Savarley, Hofs, Moulin, Brasmé, Jackson.

breeds make up the largest part of the sick, the European residents (and perhaps also the native Indians of pure blood) enjoying an almost absolute immunity.¹

Differences in the incidence of elephantiasis such as these, between the two sexes, the various periods of life, and the several races and nationalities, do not depend, in my opinion, upon any physiological characteristics that would encourage or retard its development, but on two other sets of circumstances. In the first place, the male sex, the more mature age, and partly also the coloured skin, make a predisposition for the malady, inasmuch as these represent most of the hard work and correspond to the bulk of the proletariat; and more particularly because they are far more exposed than the better-off classes to all those harmful influences of weather and neglected hygiene which we have been speaking of, as well as to wounds of the skin, with the consequences thereof, which we shall see in the next paragraph to have no slight importance as exciting causes. In the second place, the differences as between the various periods of life and the various nationalities are undoubtedly to be explained by the fact that it takes a long time, years indeed, for the specific cause of disease, associated with the particular spot and acting upon the particular person, to bring the malady to its full development in him. It is in that way we must interpret the fact of elephantiasis never having been seen hitherto in children, as well as the other fact that immigrants from Europe or the United States who had come to places where elephantiasis is endemic,² or even natives themselves, such as Hindus³ who had removed to a locality of the latter kind, do not usually show any trace of the acquired disease until after they had been several years in the place.⁴

¹ Hasselaar, Hille, Dalton.

² Guioi for Nossi-Bé, Pellissier for Réunion, Herconet for Tahiti, van Lersst for Surinam, Ross for Tanjore.

³ Annesley, Day.

⁴ Heffinger puts it at not less than fifteen years.

§ 253. PROBABLE CONNEXION WITH ACCIDENTAL INJURIES.
FILARIA SANGUINIS ACCOUNTS FOR SOME OF IT.

One of the commonest occasions of *sporadic elephantiasis* in temperate latitudes is known to be the concurrence of *chronic skin disease* of one kind or another, provided that it has gone so far as to produce some sort of disorder in the lymphatic circulation. Doubtless that is also a cause that contributes to the frequency of the malady in tropical and subtropical countries, more particularly among the lower classes of natives who go about with naked feet and are exposed time after time to *injuries of the skin* by the stings of insects (especially the introduction of sand fleas), or by sharp stones or prickly plants. It need hardly be said that this fact is very far from explaining the endemic prevalence of elephantiasis at a few limited spots; there must be in these some peculiar influences, proper to the locality, which so affect the organism as to excite the disorders of the lymphatic circulation that underlie the disease. From that point of view recent researches have been of interest, inasmuch as they prove a connexion between elephantiasis and endemic hæmaturia or chyluria, or, in other words, between it and the entrance of *Filaria sanguinis* into the human body (see vol. ii, 328). To the observations already given of that sort from India, China, Mauritius and Réunion, Zanzibar, Egypt, the West Indies, Guiana and Brazil, we may add Nachtigal's¹ information that hæmaturia and elephantiasis are to be found together in Bornou in the Greater Soudan. It is even possible, although by no means proved, that there may be the same relationship of the disease to that parasite in other regions which are subject to elephantiasis, such as the West Coast of Africa. However, we must not exaggerate the importance of that one factor in the etiology. For, in many places where elephantiasis is endemic, such as Tunis, Algiers, Mexico, most of the islands of the Pacific, and the Dutch East Indies, *Filaria sanguinis* either does not occur at all or it is so rarely found, as in the West Indies, Surinam and Tahiti, that it goes a very little way by itself in explaining

¹ L. c., ii, 403, 404.

why elephantiasis is endemic. We are accordingly driven to assume that the endemicity of the latter is bound up with some other influences proper to the locality, of the nature of which not a single tolerable guess can be hazarded as yet.

§ 254. INTRODUCTION INTO NEW LOCALITIES.

It must be taken as still doubtful whether the discovery of *Filaria sanguinis* as a frequent cause of elephantiasis (although not the only one) tends to favour the possibility of that disease being *propagated* by way of *transmission of the morbid cause*, or, in other words, the possibility of new foci of elephantiasis being started by the introduction of the parasite into new localities. It may be that Hillary's facts about the introduction of elephantiasis into Barbadoes by negroes from the Guinea Coast are to be so explained, as well as those of Ross about the outbreak of it in Tanjore within the last forty or fifty years.

Ainhum.

§ 255. CLINICAL CHARACTERS, AND GENERAL CIRCUMSTANCES.

Under this name, which is the colloquial negro term,¹ we have lately made acquaintance² with a remarkable malady located in one or two of the toes, and consisting in hypertrophy of the skin, with concurrent atrophy of the underlying tissues. It is endemic at a few points on the globe under peculiar circumstances.

Clinical history.—The disease has been nearly always found on the fifth or little toe, sometimes on the fourth, but never on any of the others.³ It starts from a slight furrow-like excavation of the skin in the

¹ The word means "to saw," from the appearance of the toe being *sawn* through.

² The references to authorities are given at the end of the text.

³ In 50 cases collected by da Silva Lima, 45 had the little toe affected, and 5 the fourth.

region of the digito-plantar fold, commencing on the inner and under side of the toe. There is not the smallest pain with it, the power of movement in the toe is unaffected, and there is no inflammation or supuration. Gradually the furrow creeps round to the outer and upper side of the toe; at the same time it cuts deeper, so that the member is encircled by a groove such as might have been made by a wire ligature. Meanwhile the toe, thus far detached from its base, has swollen to twice or thrice its normal size; and at length it hangs on to the foot by nothing but a thin stem, wagging about like a small potato. When the disease has advanced to that degree, the stem begins to ulcerate and yield a stinking ichor; the pain becomes acute, especially on walking, and if the toe does not get wrenched off by force or exfoliated by gangrene, the patient is obliged to have it removed by surgery, in which event he either acts as his own surgeon, or entrusts the operation to a practitioner of the art.

Usually the disease occurs on one foot only, but sometimes on both feet, either together or one after the other; the little toe may be the seat of it on both feet, or the little toe on the one and the fourth toe on the other.

The progress of the malady is always very slow; usually several years pass before the constriction of the toe has proceeded far enough for the patient to perceive the necessity of having the part removed; and if the separation be left to nature, it takes longer still (five to ten years).

Morbid anatomy.—Anatomical examinations of the diseased part¹ have not yielded any definite information as to the pathogenesis. The most important change consists in a considerable degree of thickening of the cutis of the toe, which sometimes looks as if it had undergone a fibrous degeneration at the point first affected. In comparatively recent cases, the adipose, muscular, tendinous and osseous tissues beneath the hypertrophied skin are found to be quite normal, and the movements free at the joints; but in cases of longer standing, the soft parts and the bones (especially those of the proximal phalanx, from which the affection always starts) are degenerated into a uniform fatty mass, and the joint between the middle and terminal phalanx ankylosed. In those parts of the toe that had survived, the vessels have been found thickened, but still containing some blood; no changes in the nerves.

The disease has not been seen except in the coloured *races* and in fact almost exclusively among *negroes*. Its principal seat is the *West Coast of Africa*. Clarke was the first to give an account of "a dry gangrene of the little toe among the natives of the Gold Coast," and thereafter came accounts of it by Dupouy. Next to the West Coast of Africa, the

¹ See the accounts by Wucherer (quoted by da Silva Lima), Weber, Schüppel, Corre and Ruault.

malady has been seen oftenest in *Brazil*;¹ it has been less common of recent years, however, than formerly, the reason possibly being, as da Silva Lima suggests, that the number of negroes has decreased. There are also accounts of occasional cases of it among negroes in *Buenos Ayres*,² the *West Indies*,³ some parts of the *United States* (Western Virginia⁴ and North Carolina⁵), the islands of *Nossi-Bé*⁶ and *Réunion*.⁷ One of the cases in the last mentioned colony was in a Hindu-Malagasy (half-breed); and in *India*⁸ there have been a few cases in Hindus of pure descent.⁹

The male sex appears to be more exposed to the disease than the female. It has never been seen in children, rarely in old men, most of the patients being in *early manhood or the prime of life*. In a good many of the cases observed, a *hereditary disposition* towards the disease has been very decidedly present: thus da Silva Lima says that he has known negro families in which everyone was attacked by the malady; in a case observed by Duhring, the father of the patient (a negro) had lost two toes from *ainhum*, and his mother was suffering from it at the time; Dupouy records a case in a negro of Senegambia, who related that his father and two of his brothers had had it.

There is complete obscurity as to the *cause of ainhum*.¹⁰ That it is not injuries to the toe from going barefoot is clear, as da Silva Lima remarks, from the fact that free negroes are also liable to it, although they usually wear something on the feet. Gongora stands quite alone in his opinion (which has nothing to warrant it) that the whole thing is a mystification, got up by the negroes in the way of a joke by tying a string round the toe. The view expounded by Collas, Corre and other French surgeons, that the disease is a form of leprosy

¹ Silva Lima, Wucherer, Moncorvo de Figueiredo, Pereira Guimarães.

² Pirovano. ³ Pontoppidan, Gongora. ⁴ Duhring.

⁵ Hornaday and Pitman. ⁶ Deblenne.

⁷ Corre, Ruault.

⁸ Crombie, Collas, Roy, Warden, Rochard.

⁹ The cases described by Guyot ('Arch. de méd. nav.,' 1879, Dec., p. 440, and 1880, Sept., p. 298), and by Suchard ('Progrès méd.,' 1882, No. 6, p. 120) as occurring on the Isle of Pines, near New Caledonia, as Gilbert Islands, have been erroneously diagnosed as *ai*

¹⁰ Da Silva Lima, in his latest paper, says: "Les *ai* absolument inconnues."

(lepra mutilans) has arisen partly from an erroneous reading of the phenomena, and partly from mistakes of diagnosis, some cases of true lepra mutilans having been declared to be cases of ainhum.

LIST OF WRITERS ON AINHUM.

* Borius, Arch. de méd. nav., 1882, Mai, 377.

Clarke, Transact. of the Epidemiol. Society, 1860, i, 105. Collas, Arch. de méd. nav., 1867, Nov., 357. Corre, ib., 1877, Juill., 71, and 1879, Févr., 136. Crombie, Ind. Med. Gaz., 1873, viii, 200, and Transact. of the Pathol. Soc., 1882, xxxii, 302.

Deblenne, Étude de géogr. méd. de l'île Nossi-Bé. Par., 1883, 209. Duhring, Amer. Journ. of Med. Sc., 1884, Jan., 150. Dupouy, Arch. de méd. nav., 1881, Nov., 385, and 1884, Mars, 260.

Gongora, ib., 1882, Avril, 312 (from the Cronica med.-quir. de la Havana, 1882, May).

Hornaday and Pitman, North Carolina Med. Journ., 1881, Septbr.

Moncorvo de Figueiredo, Arch. de méd. nav., 1876, Août, 127 (from the Revista med. de Rio de Janeiro, 1875).

Pereira Guimarães, ib., 1877, Août, 147 (from the Revista, 1876). Pirovano, Revista med.-quir. de Buenos-Ayres, 1876, xiii, 342. Pontoppidan, Lancet, 1879, Aug., 305.

Ruault, Progrès méd., 1885, Nr. 20, 399. Rochard, Arch. de méd. nav., 1883, Juin, 460. Roy, Med. Times and Gaz., 1880, Oct., 493.

Schüppel, in Virchow's Arch., 1872, lvi, 374. Silva Lima, Arch. de méd. nav., 1867, Août, 128, Sept., 206 (from the Gaz. med. di Bahia, 1867, Nos. 13, 15), and ib., 1881, Debr., 459; 1882, Janv., 54.

Warden, Ind. Med. Gazette, 1877, xii, 210. Weber, Transact. of the Pathol. Soc., 1867, xviii, 277, and 1868, xix, 448. Wucherer, in Virchow's Arch., 1872, lvi, 374.

CHAPTER XXV.

RICKETS.

§ 256. ALLEGED ORIGIN IN SEVENTEENTH CENTURY ; GLISSON'S TREATISE.

The history of rickets cannot be followed with certainty farther back than the middle of the seventeenth century. Doubtless there are passages in medical books a century earlier, on enlargement of the joints and bending of the bones in children, which may be taken with more or less reason as pointing to rickets. But in these writings there is nowhere anything to show that the distinctive characters of the malady were correctly understood, or any description of the whole group of symptoms so definite and unambiguous as to warrant us in supposing that the authors were accurately acquainted with rickets in practice. It is Glisson's incontestable merit, therefore, to have been the first, along with his contemporaries Bate and Regemorter, to present this subject in its scientific aspect, and to have made it known to the profession by his famous treatise.¹ But it would be a mistake to conclude therefrom that rickets appeared as a new disease in the time of Glisson, or that there was no general diffusion of it over the globe until the middle of the seventeenth century.² The same thing holds good for the history of this

¹ 'Tract. de rachitide, seu morbo puerorum qui "the Rickets" dicitur,' Lond. 1650 (new editions in 1660 and 1670).

² Some such opinion has in fact been held, and has found definite expression in the name "englische Krankheit," by which the malady is known in Germany. Glisson himself contributed not a little to that view of it that rickets was first seen at the beginning of the counties of Dorset and Somerset, whence it had spread to England, avoiding the southern counties. Cow

disease as for that of many more, namely, that it wanted only a stimulus of that kind from another country to rouse the attention of practitioners to a form of disease which they had previously overlooked or had failed to recognise by its distinctive features. Interest was awakened, and found expression in a rapid growth of medical writings on the subject, such as might easily lead one to the erroneous belief that a new thing had in fact come under the observation of practitioners. Without doubt, rickets in the form of a malady at large, is as old as all the other constitutional disorders of nutrition which stand in more or less intimate causal relation to defects in the people's mode of life, a class of maladies which may, indeed, increase or decrease from time to time according as the errors of living obtain to a more or less serious extent. It is impossible to say what fluctuations of that kind may have occurred in the prevalence of rickets, or whether the malady has increased in frequency or in geographical area since the seventeenth century. Our information from the past is too scanty; and even in modern times the accounts of rickets in various parts of the world afford insufficient materials for estimating its present geographical distribution.

§ 257. GEOGRAPHICAL AREA; IMMUNITY OF WARM COUNTRIES.

So far as we may conclude from the meagre contemporary data on the *geographical area of rickets*, the cases of it are most numerous and most uniformly distributed in the regions of Europe and North America within the temperate zone, the higher or lower latitudes in those parts of the world being less subject to it. In the accounts from North Greenland¹ and the Farøe Islands,² rickets is spoken of as a disease that rarely occurs; in Iceland³ also, and in the *méd.*,⁴ 1885, Mars, p. 276) that rickets is not so common now as in Glisson's time, seems to me to have just as little foundation in statistics.

¹ V. Haven, 'Ugeskrift for Læger,' 1882, lii, R. vi, 185.

i, 15.

domsforholdene i Island,' Kjöbenh.,
five years' practice in Iceland,

Scandinavian kingdoms (Norway¹ and Denmark²) it has a subordinate place in the statistics of sickness relating to the earliest years of life. Its principal seats are *Germany, England, Holland, Belgium, France, and Northern Italy*³; while Southern Italy,⁴ the southern provinces of Spain,⁵ and still more Turkey⁶ and Greece,⁷ enjoy a notable immunity from it. As regards North America I have found merely a reference here and there to the occurrence of rickets in some of the large towns of the central United States, such as New York, Philadelphia, Cincinnati and Baltimore. Parry⁸ says that the profession in that country has not spoken on the subject of rickets, because there is a wide-spread belief among them that the disease belongs strictly to the Old World; however, the statistics of sickness in Philadelphia show that to be an error, the malady being met with in that city as commonly as in the large towns of Europe. It must remain a question whether we should infer from the complete silence of medical writers in the Southern States on the subject of rickets, that the malady is absolutely rare in them.

¹ Faye ('*Norsk Mag. for Lægevidensk.*' 1862, xvi, 16) states from his experience in the Children's Hospital of Christiania: "*Rachitis er i udtalt Grad, saovidt vi kunne dømme, en meget sjelden Sygdom her.*"

² Brüniche, '*Bibl. for Læger,*' 1867, Oct., 279.

³ Mosetig, '*Oesterr. med. Jahrb.,*' 1836, Nst. F., xi, 19, for the low and wet parts of the provinces of Milan and Pavia. In Milan there is an institution exclusively for rickety children. See Pini, in '*Rivista della Beneficenza pubblica* 1881,' Octbr. Also according to Balardini, '*Topogr.-statist. med. della provincia di Sondrio,*' Milano, 1834, 55, in Sondrio; Comolli, '*Gaz. med. Lombard,*' 1848, 305, in Como; and Agostini, '*Annal. univ. di med.,*' 1874, Decbr., 478, in the province of Verona (especially the city of that name).

⁴ De Renzi ('*Topogr. e statistica med della città di Napoli, &c.,*' Nap., 1845, 321) and Trogher ('*Briefe während einer Reise durch Istrien u. a. w.,*' Triest, 1855, 93) say that rickets is common in Naples.

⁵ Trogher, l. c., says that it is common in the north of Spain down to the Portuguese frontier, disappearing towards the south; in Lisbon, he says, it is very seldom seen (l. c., p. 157).

⁶ Oppenheim ('*Ueber den Zustand der Heilkunde in der Türkei, &c.,*' Hamburg, 1833, 63; Rigler, '*Die Türkei und deren Bewohner,*' ii, 421) says that rickets and the after-effects in the bones are somewhat common in Constantinople.

⁷ Stephanos ('*La Grèce, &c.,* Par., 1884, 541) gives rickets as a rare disease in Greece; it is most often seen in a few poverty-stricken situations of Livadia and Phthiotis, on the islands of Thera, and in some mountainous parts of Euboea.

⁸ '*Amer. Journ. of Med. Sc.,*' 1872, Jan., p. 17.

Our only means of estimating the commonness of rickets at various places within the countries above-mentioned, is the statistics of Children's Hospitals and Dispensaries; and these have but a limited value for purposes of comparison, inasmuch as institutions of that kind are very different in their circumstances at different places. Having premised that much, I subjoin the results of statistical calculations on the proportion of rickety children among certain totals of patients below five years of age, treated in the following cities: Copenhagen,¹ from six years' observations at the Children's Hospital, 8·4 per cent.; Basel,² from records of out-patients during 1876-82, 15 per cent.; Dresden,³ from twenty years' observations at the Children's Hospital, 20 per cent.; Berlin,⁴ from ten years' observations among the out-patients of the Charité, 25 per cent.; Frankfurt-on-Main,⁵ from records of the out-patient department of Christ's Hospital for Children, 25 per cent. in 1881, 28 per cent. in 1882, 27 per cent. in a total of one thousand children treated during 1883; Philadelphia,⁶ in out-patient practice, 28 per cent.; London, from observations during several years at St. Bartholomew's Hospital,⁷ 30·3 per cent.; Manchester,⁸ in out-patient practice, 30·3 per cent.; Prague,⁹ from three years' records of the polyclinic, 31·1 per cent.

In Beyrout, we learn from Barret¹⁰ that he has seen a good deal of rickets among the children of the poor, the disease, however, being much less common in Syria and Arabia than in Europe.¹¹ On the Kirghiz Steppes, according to Maydell, it would seem not to occur at all. Among the accounts of medical topography in India, I find a statement by Macnamara¹² that the disease is very rare in native children; and Watson¹³ confirms that on the strength of communications which he has received from a number of Anglo-Indian practitioners. From the East Indies I know of only one reference to the malady, by Waitz¹⁴ of Java, who

¹ Brüniche, 'Bibl. for Laeger,' 1867, Oct., 279.

² Hagenbach, in 'Jahresberichten aus dem Kinderhospital in Basel.'

³ Küttner, 'Journ. für Kinderkr.,' 1856, iv, Heft. 7, 8.

⁴ From accounts in the 'Charité-Annalen,' 1883, viii, 574.

⁵ Lorey, 'Jahrb. für Kinderheilkunde,' 1884, xxii, 52.

⁶ Parry, l. c.

⁷ Gee, 'St. Barthol. Hosp. Reports,' 1868, iv, 69.

⁸ Ritchie, 'Med. Times and Gaz.,' 1871, Jan., 9.

⁹ Ritter v. Rittersheim, 'Die Pathol. und Therapie der Rachitis,' Berl., 1863.

¹⁰ 'Arch. de méd. nav.,' 1878, Août, 87.

¹¹ Pruner, l. c., 323.

¹² 'Lectures on Diseases of the Bones,' Lond., 1881, 160.

¹³ 'Med. Times and Gaz.,' 1881, Jan., 26.

¹⁴ 'On Diseases Incident to Children in Hot Climates,' Bonn, 1843, 38.

has seen a few mild cases in children of European parentage, but none in native children. In Cochin China and China, if it occur at all, it is certainly much rarer than in Europe.¹ In Japan, Rémy² saw no case of it during a residence that was, it is true, very brief; but he was also informed by those who had practised there a long time that it was the rarest thing to see a case. In the medical writings relating to the Pacific there is no mention of rickets.³ It is almost unknown in Madagascar, Mayotte, and the other islands in these waters.⁴ In Egypt, Pruner⁵ has seen it only among the upper classes and in the children of mixed race. Among the Kabyles of Algiers,⁶ and in native children of Senegambia,⁷ it is very seldom seen, if indeed it occur at all. The accounts are the same from California, where Praslow⁸ did not see a single case in seven years; as well as from the west coast of Mexico,⁹ the West Indies,¹⁰ Guiana,¹¹ Buenos Ayres and Paraguay.¹²

§ 258. INFLUENCE OF CLIMATE AND SOIL.

Although there is still much difference of opinion as to the *origin of rickets*, or as to the aberrations from the physiological nutrition and development of the infantine organism which underlie the malady; yet all authorities are agreed that the morbid process is fundamentally a disorder of nutri-

¹ Beaufile, 'Arch. de méd. nav.,' 1882, Avril, 267.

² 'Arch. gén. de méd.,' 1883, Mai, 516, "On the Rarity of Rickets in China and Japan." See also Martin, 'De la prostitution en Chine et au Japon,' Par., 1871.

³ Boyer ('Arch. de méd. nav.,' 1878, Sept., 228) says that it seldom occurs in New Caledonia.

⁴ Grenet, 'Souvenirs méd. de quatre années à Mayotte,' Montp., 1866.

⁵ L. c.

⁶ Bazille, 'Gaz. méd. de l'Algérie,' 1868, 30.

⁷ Chassaniol, 'Arch. de méd. nav.,' 1865, Mai, 508; Borius, ib., 1882, Mai, 375.

⁸ 'Der Staat Californien in med.-geogr. Hinsicht,' Gött., 1857, 56.

⁹ Lucas, 'La frégate à hélice la Victoire à Guaymas et à Mazatlan,' Par., 1868, 40.

¹⁰ Rufz, 'Arch. de méd. nav.,' 1869, Nov., 350.

¹¹ Rodschied, l. c., 273.

¹² Mantegazza, 'Lettere mediche, &c.,' i, 19, 185.

tion, having its root either in something wrong with the upbringing of the child itself, that is to say, an acquired condition, or in a morbid diathesis born with it. It would be outside the scope of my work to go at all deeply into this question; I can only advert to it in so far as the facts of geographical distribution help us to the solution.

Defective as our information is on the geographical distribution of rickets, a study of it at once brings out the noteworthy fact that the disease in any form, and particularly in its severe forms, is much rarer in tropical and subtropical countries than in higher latitudes; that, in amount and severity of type, it stands in a definite relation to climate; that countries with a cold and wet climate, subject to frequent changes of the weather, such as Holland, many parts of England, the north German plain, the mountainous regions of Central and Southern Germany, and the plains and mountainous districts of Northern Italy, if they are not the exclusive seats of rickets, are at all events its headquarters. In keeping therewith we find, moreover, that there is most of the disease at particular points in the countries named, wherever the *nature of the soil* has a good deal to do with the character of the climate: for example, in the wet plains of Lombardy,¹ of Alsace,² of Holland,³ of Belgium⁴ and of North Germany; as well as in the valleys, deeply cleft and traversed by many water-courses, of the Giant Mountains,⁵ the Thuringian Forest, the mountainous parts of South-Western Germany, and the Alpine foot-hills of Austria⁶ and Northern Italy. On the other hand, at high elevations and on dry soils within those regions, rickets is of comparatively rare occurrence: as at the highest places in the Erzgebirge,⁷ and

¹ See note 3 on p. 734.

² Renaudin, 'Rec. d'observ. de méd. des hôpit. milit.,' 1766, i, 26.

³ Thijssen, 'Geschiedk. Beschouw. der Ziekten in de Nederlanden,' Amsterd., 1824; Büchner, 'Bijdragen to de geneesk. topogr. van Gouda,' 1842, u. 2.

⁴ Guislain, 'Annal. de la soc. de méd. de Gand,' 1842, Janv.; Meyne, 'Topogr. méd. de la Belgique,' Bruxell, 1865.

⁵ Preiss, 'Die klimatischen Verhältnisse des Warmbrunner Thales,' &c. Bresl., 1843.

⁶ Maffei, 'Der Kretinismus in den norischen Alpen,' Erlang., 1855, 179.

⁷ Trautsch, in Clarus' und Radius' 'Wochentl. Beitr. zur med. Klinik,' iii, 348.

in the Norican Alps,¹ although the conditions of living among the people are in other respects unfavorable.

This predominance of rickets in wet or marshy districts, taken along with the fact that rickety children have often enlargement of the spleen, has led Oppenheim² to develop a theory of the pathogenesis, according to which the malady is a form of malarial disease or a kind of malarial cachexia. Not to mention the objection to this arising from the clinical type, it is opposed by the fact that rickets is least common just in those regions where the malaria is worst. The objection is one that had occurred to the author himself, and he has endeavoured to meet it by a number of arguments that are, to my thinking, insufficient.

§ 259. AMBIGUOUS EVIDENCE AS TO ARTIFICIAL FEEDING AND SUCKLING.

Another set of factors in the causation of rickets, whether they be intimately or remotely related thereto, reside in certain *errors of hygiene* in the child's upbringing. We find, first of all, a general kind of proof that these things are of importance for the pathogenesis, on comparing the amount and severity of type of the malady in the *children of the poor* and in the children of the well-to-do. It is impossible, owing to the want of statistics at all trustworthy, to say how much more the children of the poor are subject to rickets than those of the proprietary class. But most observers are quite agreed that the number of cases among the former is very much greater in proportion than among the latter, as well as that the cases of a severe type, and the cases of the worst type, are by far most commonly seen in poor children. Kassowitz³ found, on comparing cases in out-patient and private practice respectively, in which he had looked closely to the state of the bones, that whereas the mild cases were 23·8 per cent. in the former and 34 per cent. in the latter, the ratio for cases belonging to the second degree of severity was 32·7 per cent. to 20 per cent., and for cases of the third degree, 26·6 per cent. to 5 per cent., while cases of the worst degree, which made 6·4 per

¹ Maffei, l. c.

² 'Arch. für klin. Med.,' 1881, xxx.

³ 'Oesterr. med. Jahrb.,' 1884, p. 66

the children treated in the policlinic, did not occur in his private practice at all.

Next to insufficient cleanliness of the person, the most important errors of hygiene, so far as this disease is concerned, are insufficient or bad food and the bad air of rooms, charged with vapour and impurities of all sorts.

In the etiology of rickets, special stress has been laid at all times upon *improper feeding of infants*, such as bringing them up entirely by the bottle, taking them away from the breast too soon, suckling them too long, or, in the case of older children, plying them too much with amylaceous or other kinds of food not suited to sustain the organism of a child. We can readily understand how an improper kind of sustenance will contribute to bring on rickets in a child, when we bear in mind that everything which lowers the power of resistance in the organism must predispose it to disorders of nutrition of the kind here in question. But we shall hardly discover the true and proper factor of the disease in that element of the causation. Küttner found that of 302 rickety children, 73 had been brought up by hand, and 229 had been suckled; of 210 of the latter (the facts were not ascertained for the other 19), 23 had been kept at the breast not more than three months, 96 a whole year, and 86 more than a year. From Kassowitz's figures, which relate to 1896 sick children treated at the policlinic, it appears that infants brought up by hand from the first, or weaned within three months, were more liable to rickets than those reared at the breast in the proportion of 17·7 per cent. to 8·4 per cent.; also that the latter class had the rickets of a mild type more than the former in the proportion of 28·4 to 24·3 per cent., while the severe types of the malady were more common in artificially fed than in suckled infants in the proportion of 31·5 to 24·3 per cent. But, as Kassowitz remarks, the differences are not so great as we might expect if the doctrine in question were true. Moreover, it is a very notable fact that a high percentage (78·8) of children who acquired rickets had been suckled longer than three months, nearly one-half of them having rickets of a mild type; on the other hand, of the children brought up entirely by hand, a large proportion escaped the disease altogether, and, lastly,

the number of cases among children who had been kept at the breast between one and two years is relatively smaller than among the infants who had not been suckled more than a year. From these facts Kassowitz concludes that "there is beyond question an influence exerted by the processes of nutrition in children within the first two years of life, in the way of starting and developing rickets, an influence that can even be expressed numerically; but that influence is by no means so paramount as to warrant us in regarding the errors in the administration and assimilation of food as the only, or even the principal, cause of rickets." And unquestionably the case is the same as regards the disease-producing effect of diet in older children. I will refer here to one specially noteworthy point: namely, that rickets in tropical and subtropical countries is infinitely less common, as nearly all observers are agreed, among the native children, whose diet, especially if they belong to the lower classes, is meagre in quantity and quality and almost purely vegetable, than among the much better fed children of well-to-do European residents. It is in such facts as these that we see how absolutely different in importance are disorders of nutrition in producing rickets and in producing scrofula. In many equatorial and subtropical countries (such as the littorals of Syria and Arabia, India, the East Indies, Egypt, Abyssinia, Tunis, Algiers, Brazil and Peru), rickets is a rare disease; whereas malnutrition is in them a real cause of scrofula being common among the children of the poorer class of natives.

§ 260. IMPURE AIR OF MORE CONSEQUENCE THAN IMPROPER FOOD.

A good deal more important for the origin of rickets than upon the organism of the child when it is kept continuously in a badly ventilated and crowded apartment, where the air is saturated with moisture and tainted with the products of decay. This will happen usually to the dwellings of the poor the poor; and in that way,

the greater amount of rickets among the former class. Not to mention the good effects of removing rickety children from the confined dwellings where they had been reared, into the open country (a speedy cure of the malady following), the importance of that factor is shown from the geographical point of view, in the marked exemption from rickets which those countries in lower latitudes enjoy, where the climate is such during the whole, or most of the year as to allow the children to be always in the open air (an advantage that naturally tells most in favour of the poor), and where the only victims of rickets are such children as are unable, for one reason or another, to share in that benefit to the full extent. Rickets is unknown in Kabylia, as well as among the nomade population of the uncultivated Kirghiz steppes. It is rare, according to Macnamara, among native Indian children, and quite unknown among those of the poor natives who live in the open air day and night; if it occur at all, it is only where the want of pure air is specially felt: "when it does occur in the children of soldiers, it is in damp districts, where the children are confined in huts." Lastly, I shall mention in support of this view a fact that Waitz had often verified in his experience, namely, that children who were brought out from Europe to Java suffering from rickets, recovered from the malady in a few months without the aid of any medicinal remedies.

Whether there is a congenital rickety diathesis, as there is one of scrofula, is a point that we can hardly decide by reference to the experience of many countries. In this connexion, as is well known, special stress has been laid on syphilis of the parents. But, if we look at the matter from the point of view of geographical distribution, we have to remark that the areas of syphilis and of rickets by no means correspond. At the same time we cannot altogether reject the idea that syphilis, like other serious maladies of the parents which are calculated to have an injurious influence on the development and viability of the offspring, may produce in the new-born infant such as

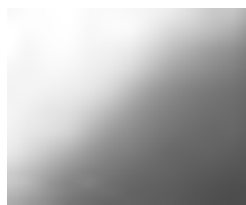
§ 261. BRITTLENESS OF THE BONES IN NEGROES.

I introduce here a statement by Levacher¹ on the remarkable frequency of *fragilitas ossium* in negroes. I have searched in vain for any confirmation of it in other medical writings from the tropics; the only thing at all bearing on it is Pruner's² assertion that the proportion of lime salts is excessive in the bones of negroes.

"Les fractures spontanées," says Levacher, "sont assez fréquentes parmi les nègres, mais elles peuvent se présenter chez eux sans qu'il existe aucune apparence de rachitis et de scrofules. Les cas de ce genre sembleraient constituer, sous le climat de tropiques, une maladie presque spéciale du système osseux, pouvant reconnaître pour causes la nourriture, le genre de vie, l'habitation dans certains lieux, et caractérisée par la diminution des principes gélatineux et par la surabondance du phosphate de chaux. J'ai été surtout frappé, dans de semblables circonstances, de la rapidité avec laquelle pouvoit avoir lieu la consolidation du cal."

¹ 'Guide méd. des Antilles,' Par., 1840, 332.

² 'Krank. des Orients,' 323.



CHAPTER XXVI.

RHEUMATISM AND RHEUMATIC FEVER.

§ 262. GROWTH OF THE MODERN DOCTRINE OF RHEUMATISM; CULLEN'S MERITS.

The ancient and mediæval physicians made use of the terms *ῥεύμα* (or *ῥευματισμός*) and *κατάρροος* indifferently to designate all those morbid conditions which arose, as they thought, from the "defluxion" of mucus upon some part or other of the body. In the earliest period of Greek medicine it was assumed that this mucus, as representing the primary quality of cold, came from the brain in its capacity of an absorbent and secreting gland.¹ At a later date, however, when the brain had come to be recognised as the centre of the nervous system and the old notion of its glandular function given up, the origin of the materies peccans ("cold mucus") was explained according to humoralist doctrines, the idea of "defluxion" being still retained.² Those Greek terms, accordingly, were associated in the minds of the physicians of the time with a constitutional morbid state; whereas, if they wanted to speak of the malady corresponding to the modern "rheumatism," they used the word *ἄρθριτις*, or, if it were the chronic form in the hand or foot, they

¹ See Hippocrates, 'Lib. de ventis,' § 10, ed. Littré, vi, 104; Aristoteles, 'De sensu,' cap. v, ed. Casaubon, Genev., 1605, i, 496.

² Thus Dioscorides, 'De materia medica,' lib. i, cap. 110, ed. Kühn, i, 110 (*ῥεύμα πτομάχου καὶ κοιλίας*, i.e. belly flux); Aræteus, 'De causis et signis diuturnor. morb.,' lib. i, cap. ix, and lib. ii, cap. vi, ed. Kühn, 96, 149; Galen, 'Method. med.,' lib. vii, cap. xi, ed. Kühn, x, 513; 'ad Glauconem Method. med.,' lib. ii, cap. ii, c. c. xi, 79, 'De curandi ratione per venæsectionem,' cap. viii, c. c. xi, 275; Caelius Aurelianus 'Morb. chron.,' lib. ii, cap. vii, ed. Almelooven, Amsteloed., 1755, 382 ('defluxio, quam Græci rheumatismum vocant'); Paulus, lib. iii, cap. lxiā (*ῥευματισμός λευκός*, i.e. fluor albus).

called it *ποδάγρα* or *χειράγρα*. As *ῥευματισμός* was their general name for all inflammations of joints, they included rheumatism and gout under it along with the others.¹ It appears, moreover, from the descriptions given of *ῥευματισμός* in the writings of several of the Greek physicians, that an acute rheumatic disorder involving more joints than one was not unknown to them.² In the sixteenth century, as the Græco-Arabian humoralist doctrines came gradually to be abandoned, the words "rheuma" and "catarrhus" lost their old constitutional significance. The example having been set by Baillou,³ the term "rheumatism" was applied in the same sense in which it is now used; while "catarrh" began to be reserved for inflammatory affections of the mucous membranes associated with hyper-secretion or downward flux. An important forward step in the doctrine of rheumatism was taken in the seventeenth century by Sydenham, who sketched the peculiarities of acute rheumatism in clearer outlines than had been done previously by Baillou or any other writer.⁴ But it was in the century following that the crowning service was rendered by Cullen,⁵ who was the first to make out the specific differences between acute and chronic articular rheumatism, and between articular and muscular rheumatism; he combatted the theory then current of the "rheumatic acrimony," assigned "chill" as the common cause of all these maladies, and in that sense founded the modern doctrine of rheumatism. It has to be said, however, that Cullen, with his theory of chill as the essential factor in the disease, introduced a certain amount of one-sidedness into medical opinion, which has not been altogether got rid of at the present day; while, on the other hand, he gave rise to the practice of taking "chill" and "rheumatism" to be in a sense the same thing, so that any kind of disease, if it were referable to a process of chill or were thought to be so referable, was called "rheumatic." In that way a vague

¹ See Vol. II of this work, p. 650-51.

² Compare the history of a case given in the Hippocratic treatise, 'De affectionibus,' § 30, ed. Littré, vi, 242; and Aëtius, Sermo xii, cap. vi, ed. Basl, 1533, 308.

³ 'Liber de rheumatismo,' Opp. Genev., 1762, iv, .

⁴ 'Observ. med.,' sect. vi, cap. v, Opp., Genev.,

⁵ 'First Lines of the Practice of Physic' (Genev.

use of the word "rheumatism" was once more introduced into pathology, or at all events into the terminology of disease, and has continued to the present time.

Among the more important developments of the doctrine of rheumatism, we have still to mention two: (1) the evidence adduced, at the end of last century, of affections of the heart occurring in the course of acute articular rheumatism; and (2) the doctrine founded in the beginning of the present century, of "arthritis nodosa," as a form of disease differing entirely from chronic articular rheumatism both in its causation and in its anatomy.

There are indications, it is true, of an affection of the heart in rheumatic fever in writings as early as Morgagni; but the first to recognise correctly and to describe the intimate connexion between the two things was the English physician, Pitcairn. The following is Matthew Baillie's brief comment on the point:¹

"We know but little of the causes that lead to dilatation of the heart; it seems, however, that we should include among them the irritation of rheumatism fixing itself in that organ. At all events Pitcairn has seen that happen in some cases." We find a more precise statement in the paper by Wells on cardiac rheumatism;² Pitcairn, he says, made his observations on the implication of the heart in rheumatic fever, when he was acting as Physician to St. Bartholomew's Hospital in 1778, and he gave an account of them to a number of his friends and to his pupils. Not long after, Odier³ called attention to the connexion between rheumatic fever and heart disease. Then in 1809, Dundas⁴ published his observations on nine cases of heart disease which all followed rheumatic fever, seven of them proving fatal. In six of these an examination was made after death, and in all but one of them there was found pericarditis ("the pericardium adhered to the heart"), dilatation of the left ventricle ("the left ventricle in all the cases was much enlarged in size, but not in thickness"), and the muscular substance pale and soft. But the most important article on the subject belonging to those years was the memoir by Wells, which has just been referred to; in it he gives full details of fourteen cases treated either by himself or by his colleagues (Baillie, Lister, Brodie and others), as well as the results of post-mortem examination in several (pericarditis, enlargement of the heart, endocarditis).

¹ 'Morbid Anatomy of some of the most important parts of the Human Body (German ed. by Sömmering, 2nd ed., Wien, 1805, p. 282).

² 'Improvement of Medical and Chirurgical

Concerning arthritis nodosa (rheumatismus deformans), we find him as early as the seventeenth and eighteenth centuries, in such writers as Sydenham and Morgagni. The first to recognise the distinctive characters of the disease was Landré-Beauvais,¹ who described it as a peculiar form of gout. After him comes Haygarth, who considered the "nodosity of the joints" to be an entirely different thing from chronic articular rheumatism, and gave an excellent description of its clinical history as well as some indication of its anatomical nature.²

§ 263. GEOGRAPHICAL DISTRIBUTION OF "RHEUMATISM" AS A WHOLE.

If we may safely conclude from these few historical references that rheumatism, in the general sense of the term, has been prevalent to the widest extent in all ages; it will have been at the same time clear from the nature of the references quoted, that we are very far from being able to form any estimate of the variety of types that were comprehended under the term "rheumatism," or of the relative frequency of each, or to form any opinion as to increase or decrease in various periods of the history of mankind, or at various parts of the globe. Even our most recent accounts of the topography of disease are not at all sufficient for a geographical estimate of that sort, the reason being that the term used in most of them is merely the general name "rheumatism." I must, therefore, disclaim at the outset the possibility of making any sharp separation, in what follows as to geographical distribution, between the several morbid processes included under rheumatism. Although these have nothing more in common than the anatomical groundwork, I must confine myself to dealing with the matter in a general way, appending in a separate section such facts as serve to elucidate the geographical area of rheumatic fever.

The *distribution of rheumatism*, taken as a whole, extends uniformly over the entire globe. It is most frequent in arctic countries and in the regions of either hemisphere that

¹ 'Doit-on admettre une nouvelle espèce de goutte sous la dénomination de goutte asthénique primitive,' Par., an., viii.

² 'A Clinical History of Diseases,' Part 1 being 'the Acute Rheumatism,' (2) "A Clinical History of Lond., 1805.

come nearest to them in climate: including *Kamschatka*,¹ northern *Siberia*,² *Lapland*,³ *Iceland*,⁴ and the *Farøe Islands*,⁵ *Greenland*,⁶ *Newfoundland*,⁷ *Hudson's Bay Territory* and *Alaska*.⁸ It is not less general, whether on the coast or in the interior, in many parts of *Russia*, the *Scandinavian Kingdoms*, *Germany* and *Great Britain*.

In *Denmark*, according to Otto,⁹ rheumatism holds a foremost place among the diseases of common occurrence. In *Sweden* the chief seats of the malady are given as follows:¹⁰—Along the Gulf of Bothnia and the Baltic: *Westerbotten*, *Angermanland* (especially the districts of *Sollefteo* and *Hernösand*), *Gestrikeland* (*Jerfsö* in particular), *Helsingland* and *Upland* (particularly the district of *Upsala*); on the west coast: *Bohuslän*, *Schonen* and *Halland*; and in the interior: *Jemtland*, *Dalarne* (especially *Falun*), *Wermland*, *Nerike* and *Westmanland*. In *England* rheumatism is so universal that the earlier¹¹ authorities reckoned it among the endemic diseases of the country;¹² the southern counties and the northern hilly counties (*Yorkshire*, *Westmoreland*, &c.) would appear to have most of it; it is reported as especially common in *Bristol* by *Symonds* ('*Transact. Prov. Med. Assoc.*' 1834, ii, 174), and in *Manchester* by *Lyon* (ib., 1841, ix, 338, and by another writer in '*Med. Times and Gaz.*' 1868, July, p. 64). In *Ireland*, according to the statistical returns,¹³ it is more common in the country districts than in

¹ *Bogorodsky*, '*Med. Ztg. Russl.*,' 1854, 10.

² *Parry*, in his '*Account of the Expedition to the Arctic Regions*;' *Schrenck*, '*Reise in die Tundren der Samojeden*;' *Gebler*, '*Annal. der Hlkt.*,' 1813, 329; *Rex*, '*Med. Ztg. Russl.*,' 1859, 408.

³ *Harmens*, '*Medicina Lapponum*,' *Lond., Goth.*, 1734.

⁴ *Holland*, '*Edinb. Med. and Surg. Journ.*,' 1812, April, 205; *Schleisner*, '*Island*,' 27; *Finsen*, '*Jagttagelser angaaende Sygdomsforhold. i. Island*,' *Kjöbenh.*, 1874, 144.

⁵ *Manicus*, '*Bibl. for Laeger*,' 1824, i, 15; *Panum*, ib., 1847, 276.

⁶ *Lange*, '*Bemaerkninger om Grönlands Sygdomsforhold.*,' *Kjöbenh.*, 1864, 29.

⁷ '*Statist. Reports of the Brit. Army*,' *Lond.*, 1853, 206.

⁸ *Blaschke*, '*Topogr. med. port. Novi-Archangelcensis*,' *Petropoli*, 1842, 66, 75.

⁹ '*Transact. of the Provinc. Med. Assoc.*,' 1834, vii, 206.

¹⁰ See *Huss*, '*Om Sverges endem. Sjukdomar*,' *Stockh.*, 1852; *Berg*, '*Bidrag till Sveriges med. Topogr. och Statistik*,' ib., 1853; and the medical reports that have been published annually since 1851.

¹¹ *Millar*, '*Observations on the Prevalent Diseases of Great Britain*,' *Lond.*, 1770, 315; *Autenrieth*, '*Unters. über die Volkskr. in Grossbritannien*,' *Tübingen*, 1823, 41.

¹² From the dispensary practice in many parts of England, the cases of rheumatism have been estimated at 5 per cent. of the sickness from all causes. I have no doubt that a more accurate estimate has been assigned to it; but I do not think that the want of statistical inquiry can afford a

the towns, the counties of Cork, Waterford and Kerry being given as its principal seats.¹

Nearly all the notices of rheumatism from a large number of places in *Holland, Belgium, Switzerland*² and *France*, speak of it as among the commonest of maladies in those countries; and the same holds for the southern peninsulas and islands of Europe, including *Italy* and *Sicily, Spain* and *Portugal, Roumania*,³ *Turkey*⁴ and *Greece*.⁵

In *Italy* the worst spots are stated to be in the Alpine valleys of Piedmont⁶ and the Val Tellina,⁷ on the Ligurian coast, the plain of the Po, and in many parts of Central Italy, Naples⁸ and Sicily.⁹ The endemic prevalence of the malady on the table-land of *Spain* is asserted by Thiéry;¹⁰ in the provinces of *Portugal* north of the Tagus, and in the adjoining districts of Spain, rheumatism is as common as in England;¹¹ in Lisbon it counts among the most ordinary complaints;¹² and even the southern parts of Spain are by no means notably exempt from it, as appears from the statements about its frequency in Gibraltar.¹³

From Asia Minor and Central Asia we have information of its endemic prevalence on the *Armenian*¹⁴ plateau, in

¹ 'First Report of the General Board of Health,' Dublin, 1822, p. 46.

² Füter, 'Schweiz. Zeitschr. für Med.,' 1850, i. We have more detailed information as to the forest-cantons (Uri, Schwyz, Unterwalden and Zug) in a paper in the 'Schweiz. Arch. der Medicin,' i, Heft 2, 53; also for Lausanne by de la Harpe ('Schweiz. Ztschr. für Med.,' 1849, 155) and Upper Engadin by Ludwig ('Das Oberengadin in seinem Einflusse auf Gesundheit und Leben,' Stuttg. 1877, 102).

³ Dobronrawow in Hecker's 'Annal. der ges. Hlkde.,' 1835, xxxi, 341.

⁴ Rigler, 'Die Türkei und deren Bewohner,' ii, 357; Sandwith, 'Assoc. med. Journ.,' 1854, 435.

⁵ Röser, 'Krankh. des Orients,' 79; Stephanos, 'La Grèce, &c.,' Par., 1884, 541.

⁶ Brunner, 'Verhandl. der Schweiz. ärztl. Gesellsch.,' 1829, i, 110; Guislain, 'Lett. méd. sur l'Italie,' Gand, 1840, 12.

⁷ Balardini, 'Topogr. med. della provincia di Sondrio,' Milano, 1834, 61.

⁸ de Renzi, 'Topogr. stat.-med. della città di Napoli, &c.,' Nap., 1845, 326.

⁹ Irvine, 'Observ. upon Diseases in Sicily,' Lond., 1810, 105; Ziemann, 'Ueb. die vorherrsch. Krankh. Siciliens,' Haunov., 1819, 167.

¹⁰ 'Observ. de physique et de médecine . . . d'Espagne,' Par., 1791, i, 217, 249, u. a. O.

¹¹ McGregor, 'Lond. Med. and Phys. Journ.,' 1830, Sept., 188.

¹² Wallace, 'Edinb. Med. and Surg. Journ.,' 1829, Jan., 75; Brandt in Debel's 'Reports,' 1870, 388.

¹³ Tulloch, 'Statist. Reports of the Brit. Army,' Lond., 1853, 87.

¹⁴ Wagner, 'Reise nach dem Arrarat,' Stuttg., 1848.

*Syria*¹ (Yates had 429 cases of rheumatism among 4298 patients in the year 1842-43 at the British Dispensary in Beyrout²), in *Palestine*,³ on the coast and in the interior of *Arabia*,⁴ and in *Bokhara*⁵ and *Afghanistan*.⁶ In *India*, according to nearly all observers,⁷ rheumatism is not only more frequent than in many countries of the temperate zone, but in fact it holds, after the malarial fevers, one of the first places in the statistics of sickness. We have details of it from nearly all parts of the country: including Lower Bengal,⁸ Tirhoot,⁹ Chota Nagpore,¹⁰ the Himalayan slope,¹¹ and other regions of the Bengal Presidency; the Upper Godavery in Central India;¹² many parts of the Madras Presidency;¹³ Cochin,¹⁴ Goa¹⁵ and other places on the Malabar Coast; Balgâm, Poona,¹⁶ Aurungabad and Satara,¹⁷ Gujerât,¹⁸

¹ Pruner, 'Krankh. des Orients,' 309; Rafalowitsch, 'Ausland,' 1848, Nr. 218.

² 'Lond. Med. Gaz.,' 1844, Feb., 566.

³ Tobler, 'Beitr. zur med. Topogr. von Jerusalem,' Berl., 1855, 39.

⁴ Aubert Roche, 'Annal. d'hyg.,' l. c.; Pruner, l. c.; Malcolmson, 'Journ. of the Royal Asiat. Soc.,' viii, 279; Palgrave, 'L'Union méd.,' 1866, Nr. 20, 308. Steinhauser ('Transact. of the Bombay Med. Soc.,' 1855, new ser., ii, 237), to show how common it is in Aden, mentions that 276 out of 2355 patients in the military hospital during one year, were admitted for rheumatism.

⁵ Mir-Izzet-Ullah, 'Journ. of the Royal Asiat. Soc.,' viii, 335; Burnes, 'Transact. of the Calcutta Med. Soc.,' vii, 461.

⁶ Thornton, 'Gazeteer.'

⁷ Malcolmson, 'Observations on Some Forms of Rheumatism prevailing in India,' Madr., 1835; Morehead, 'Clinical Researches, &c.,' Lond., 1856, ii, 422; Gordon, 'Indian Annals of Med. Sc.,' 1859, Jan., 1; Huillet, 'Arch. de méd. nav.,' 1868, Janv.

⁸ Voigt, 'Bibl. for Laeger,' 1833, ii, 22; Macpherson, 'Lond. Med. Gaz.,' 1841, ii, 546.

⁹ Evans, 'Transact. of the Calcutta Med. Soc.,' 1829, iv, 245; Tytler, ib., 375.

¹⁰ Breton, 'Transact. of the Calcutta Med. Soc.,' ii, 241; Dunbar, 'Ind. Journ. of Med. and Phys. Sc.,' 1836, n. s., i, 640.

¹¹ Curran, 'Dubl. Quart. Journ. of Med. Sc.,' 1871, Aug., 101.

¹² Houston, 'Madras Quart. Journ. of Med. Sc.,' 1866, April, 307.

¹³ Geddes, 'Clin. Illustr. of the Diseases of India,' Lond., 1846, 442; Bidie, 'Edinb. Med. Journ.,' 1857, Oct., 340; Balfour, 'Edin. Med. and Surg. Journ.,' 1847, July, 33; Shanks, 'Madras Quart. Journ. of Med. Sc.,' 1839, July, 243, 255, 1841, Jan., 31; Henderson, ib., April, 137, Oct., 311, 337; Parry, ib., 1842, April, 142; Ranking, ib., 1863, July, 49.

¹⁴ Day, ib., 1861, Oct., 256.

¹⁵ Account in 'Arch. de méd. nav.,' 1868, Mars, 173.

¹⁶ Hunter, 'Transact. of the Bombay Med. Soc.,' 1839, ii, 221.

¹⁷ Young, ib., 1839, i, 65.

¹⁸ Gibson, 'Ind. Journ. of Med. and Phys. Sc.,' 1837, n. s., ii, 317.

Cutch,¹ and Sind² in the Bombay Presidency;³ Meerut,⁴ Futtegar⁵ and other parts of the Upper Provinces.⁶

The reports of the army medical officers in India, which I shall revert to in the sequel, show us how well founded are the frequent complaints about the injurious effects of rheumatism on the health in India, not merely among the foreign residents, but also among the natives. Thus, Young says of Aurungabad, after speaking of malarial diseases: "Of all other diseases to be met with at this station, there is none so calamitous in its consequences as rheumatism. . . . This is the greatest affliction with which a poor native can be assailed." And many other authorities write in the same strain. Gordon puts the cases of rheumatism among the Indian troops in general at 6·89 per cent., or, inclusive of the women and children, at 10 per cent. of the total strength.

Similar accounts of rheumatism being endemic come from various parts of *Lower India*⁷ (Prome, Rangoon, Malacca, Singapore), from *Cochin China*,⁸ and the *Malay Archipelago*⁹ (particularly Samarang¹⁰ in Java, the coasts of Borneo and Sumatra,¹¹ and the Riouw-Lingga group¹²); also from a number of places on the coast of *China*¹³ (Chusan, Shanghai, Canton, Hong Kong, Ningpo and Hankow); from *Japan*;¹⁴

¹ Winchester, 'Transact. of the Bombay Med. Soc.,' 1840, iii, 10.

² Don, ib., 1838, i, 65.

³ Kinnis, 'Edin. Med. and Surg. Journ.,' 1851, April, 294, July, 1, Oct., 265.

Jackson, 'Transact. of the Calcutta Med. Soc.,' i, 296.

⁵ Curran, 'Edinb. Med. Journ.,' 1873, Jan.

⁶ McGregor, 'Observations on the Principal Diseases in the North-West Provinces of India,' Calcutta, 1843, 201.

⁷ Walsh, 'Lond. Med. and Phys. Journ.,' 1829, Febr., 105; Murchison, 'Edinb. Med. and Surg. Journ.,' 1855, April, 249; Ward and Grant, 'Official Papers, &c.,' Pinang, 1830; account in 'Madras Quart. Med. Journ.,' 1839.

⁸ Richaud, 'Arch. de méd. nav.,' 1864, Mai, 355; Breton, 'Considérations sur la guérison des plaies chirurg. et traumat. chez les Annamites,' Par., 1876, 11.

⁹ Heymann, 'Krankh. der Tropenländer,' 180; Pop, 'Nederl. Tijdschr. voor Geneesk.,' 1859, iii, 23; v. Leent, 'Arch. de méd. nav.,' 1867, Oct., 246; van der Burg, 'De Geneesheer in Nederl.-Indie,' Batav., 1882, i, 17, 81, 91.

¹⁰ v. Leent, l. c., 1868, Oct., 407.

¹¹ Id., 1872, Janv., 21, 1877, Févr., 81.

¹² De Meijer, 'Nederl. Tijdschr. voor Geneesk.,' 1859, iii, 347.

¹³ Lockhart, 'Edinb. Monthly Journ. of Med.,' 1846, March, 164; Bennett in 'Arch. de méd. nav.,' 1866, Sept., 163; Smart, 'Transact. of the Epidemiol. Soc.,' 1860, i, 220; Friedel, 'Beiträge,' &c., 87, 100, 120; Smith, 'Reports,' 1870, 350. Macpherson records that 268

in a force of 600 men in the Chinese Expedition

¹⁴ Maget, 'Arch. de méd. nav.,' 1877, Mai, 379; &c., Berl., 1878, 197; Godet, 'Étude sur l'hyg'

from many of the *Polynesian* groups (Hawaii,¹ Tahiti and Eimeo,² Fiji,³ the Marquesas,⁴ Samoa,⁵ and New Caledonia⁶); and from *Tasmania*⁷ and *New Zealand*.⁸

Besides these accounts relating to Europe, Asia and the Pacific, we have not less abundant evidence of the universal diffusion and great frequency of rheumatism on the continent of Africa and the islands belonging to it, both in tropical and subtropical latitudes. Besides *Réunion*,⁹ and the islands of *St. Marie*¹⁰ (east coast of Madagascar) and *St. Helena*,¹¹ we find the *Cape*¹² mentioned as a country peculiarly subject to rheumatism; also in the *interior of South Africa*¹³ it plays a prominent part, and there are accounts to the same effect from the *West Coast*¹⁴ (including Fernando Po¹⁵ and the Cape Verde Islands¹⁶), *Senegambia*,¹⁷ the *Greater Soudan*,¹⁸ *Tunis*,¹⁹ *Algiers*,²⁰ *Egypt*²¹ and *Abyssinia*.²²

¹ Chapin, 'Amer. Journ. of Med. Sc.,' 1837, May, 43; Häolé, 'Sandwich Island Notes,' London, 1854; Gulick, 'New York Journ. of Med.,' 1855, March.

² Wilson, 'Edinb. Med. and Surg. Journ.,' 1806, July, 286.

³ 'U. S. Explor. Exped.,' Philad., 1845, iii, 93.

⁴ Clavel, 'Arch. de méd. nav.,' 1884, Août, 153.

⁵ Turner, 'Glasgow Med. Journ.,' 1870, Aug., 502.

⁶ Charlopin, 'Notes rec. en Calédonie,' &c., Montp., 1868, 21.

⁷ Dempster, 'Transact. of the Calcutta Med. Soc.,' 1835, vii, 357; Milligan, *ib.*, 1836, viii, app. x; Power, 'Dublin Journ. of Med. Sc.,' 1843, March.

⁸ Johnson, 'Dubl. Med. Press,' 1843, Nr. 221; Thomson, 'Brit. and For. Med.-Chir. Rev.,' 1854, Oct.

⁹ Dutroulau, 'Traité,' 49.

¹⁰ Borius, 'Arch. de méd. nav.,' 1870, Août, 81.

¹¹ McRitchie, 'Transact. of the Calcutta Med. Soc.,' 1836, viii, App. xxix.

¹² Lichtenstein, in Hufeland's 'Journ. der Hlkde.,' 1802, xv, Heft 1, 179; Black, 'Edinb. Med. and Surg. Journ.,' 1853, April, 266; Scherzer, 'Ztschr. der Wiener Aerzte,' 1858, 152 (he speaks of rheumatism as "the principal disease of the Cape, both as regards frequency and untoward results"); Schwarz, *ib.*, 630; Egan, 'Med. Times and Gaz.,' Sept., 1877, 355.

¹³ Fritsch, 'Arch. für Anat. u. Physiol.,' 1867, 733; Livingstone, in his 'Travels,' gives rheumatism as one of the commonest diseases, next to malarial fever, in the central regions of Southern Africa.

¹⁴ Oldfield, 'Lond. Med. and Surg. Journ.,' 1835, Nov., 403; Clarke, 'Sierra-Leone,' &c., Lond., 1844, and 'Transact. of the Epidemiol. Soc.,' 1860, i, 107; Daniell, 'Sketches of the Med. Topogr. of the Gulf of Guinea,' Lond., 1849, 138; Moriarty, 'Med. Times and Gaz.,' 1866, Decbr., 663 (Sierra-Leone and Gold Coast); Faria, 'Arch. de méd. nav.,' 1879, Mai, 329 (Slave Coast).

¹⁵ Quatan, 'Arch. de méd. nav.,' 1868, Jan., 71.

¹⁶ Hopffer, *ib.*, 1868, Jan., 180.

¹⁷ Chassaniol, *ib.*, 1867, Septbr., 178; Thaly, *ib.*, 1867, Septbr., 178; Rey, *ib.*, 1877

"Cette affection," says Feris with reference to the Slave Coast, "est tellement fréquente chez les blancs autant que chez les noirs, qu'on pourrait presque la considérer comme une maladie endémique."

Pruner says that rheumatism is almost as common in Egypt as in India, and he adds: "If it be asked what is the commonest disease of the Libyan desert, the answer must be, rheumatism." "In Algiers," says Deleau, "it was a rare thing for one to converse with an Arab who did not speak of rheumatic pains."¹

In our topographical notices of disease in the northern parts of the New World we find, besides the above-quoted references to the very common occurrence of rheumatism in arctic countries, corresponding information for the mountainous regions of the West, such as *Washington Territory*,² *Montana*, *Dakota*,³ *Oregon*⁴ and northern *California*.⁵

For the *Mississippi Valley* and the *Eastern States* of the Union the accounts of the disease are scanty; but they are sufficient to let us infer that rheumatism is universally diffused and one of the commonest of complaints.⁶ We have more definite information from *Mexico*,⁷ relating to the

¹ It is certainly a question whether some of these pains should not be attributed to syphilis, which is general among the natives in Algiers.

² Suckley, 'Transact. of the Amer. Med. Assoc.,' 1859, x; Hegar, 'Statist. Reports of the U. S. Army during the Years 1855—1860,' Washington, 1860, 263.

³ Harvey, 'New York Med. Record.,' 1879, April, 345.

⁴ 'U. S. Exploring Expedition,' iv, 482.

⁵ Blake, 'Amer. Journ. of Med. Sc.,' 1852, July, 59.

⁶ Drake, 'Treat. on the Principal Diseases of the Interior Valley of North America,' Philad., 1854, ii, 766.

⁷ Stricker, 'Hamb. Ztschr. für Med.,' xxxiv, 529; Müller, 'Dtsch. Klin.' 1857,

Juin, 401; Borius, ib., 1882, Mai, 370; Herbert, 'Une année méd. à Daggam,' Par., 1880, 23.

¹⁸ Nachtigal, 'Sahara und Sudan,' i, 148 (for Murzuk, Fezzan).

¹⁹ Ferrini, 'Saggio sul clima . . di Tunisi,' Milano, 1860, 138; Friocourt, 'Arch. de méd. nav.,' 1884, Juill., 16.

²⁰ Deleau, 'Mém. de méd. milit.,' 1842, llii, 230; Haspel, 'Malad. de l'Algérie,' Par., 1852, ii, 418; Bertherand, 'Méd. et hyg. des Arabes,' Par., 1855; Arnaud, 'Méd. et hyg. des pays chauds,' &c., 418; Challan, 'Gaz. méd. de l'Algérie,' 1868, 117.

²¹ Pruner, l. c., 309; Hartmann, 'Naturgesch.-med. Skizze der Nilländer,' Berl., 1866; Mayer, 'Arch. de méd. nav.,' 1869, Mai, 326 (Alexandria); Ann., 'Annal. univ. di med.,' 1871, Sept., 514.

²² Petit in Lefèbvre, 'Voyage,' l. c.; Aubert-Roche, Courbon, 'Observ. topogr. et méd. rec. dans un voyage à Par., 1861, 42 (relates to the Abyssinian Highlands).

table-land as well as the tierra templada and the coast-belt; also from *Nicaragua*,¹ although the malady is said (questionably) to be rare in Panama² and on the hot coast of Guatemala.³ It is reported also from several of the *West Indian*⁴ islands (St. Domingo,⁵ St. Thomas,⁶ St. Bartholomew,⁷ Barbadoes,⁸ Martinique⁹, Guadeloupe¹⁰ and others); as well as from *Guiana*,¹¹ certain interior provinces of Brazil (Goyaz¹² and Maranhão)¹³ the marshy districts of Paraguay,¹⁴ Entre Rios and other River Plate States,¹⁵ Ecuador (Quito),¹⁶ Peru,¹⁷ and above all, Chili:¹⁸ "Valparaiso est, pour ainsi dire, leur climat de prédilection," says Duploux, writing on the frequency of rheumatic disorders on the west coast of South America.

¹ Monatsbl. für Statistik, Nr. 6, 41; Jourdanet, 'Le Mexique,' &c., 341; Thomas, 'Mém. de méd. milit.,' 1866, Decb., 518; Heinemann, in Virchow's 'Archiv,' 1873, lviii, 161.

² Bernhard, 'Dtsch. Klinik,' 1854, Nr. 2.

³ Lidell, 'New York Journ. of Med.,' 1852, July, 92.

⁴ Bernoulli, 'Schweiz Ztschr. für Med.,' 1864, iii, 100.

⁵ Chisholm, 'Manual of the Climate,' &c., Lond., 1822, 121.

⁶ Pouppé-Désportes, 'Maladies de St. Domingue,' ii, 127.

⁷ Barclay, 'Bibl. for Laeger,' 1830, i, 109.

⁸ Leurén, 'Svenska Läk. Sällsk. Hdl.,' ii, 175; Forström, ib., iv, 231.

⁹ Jackson, 'Bost. Med. and Surg. Journ.,' 1867, July, 447.

¹⁰ Ruz, 'Arch. de méd. nav.,' 1869, Août, 139.

¹¹ Carpentier, ib., 1873, Decbr., 433.

¹² Rodschied, 'Med. Bemerk. über Rio Essequibo,' Fft.-a-M., 1796, 279; Bajon, 'Nachrichten zur Gesch. von Cayenne.' From the French. Erfurt, 1780, ii, 60; Blair, 'Account of the Last Yellow Fever Epidemic,' &c., Lond., 1850, 21.

¹³ Gardner, 'Travels in the Interior of Brazil,' Lond., 1846.

¹⁴ Plagge, 'Dtsch. Klinik,' 1857; 'Monatsbl. für Statistik,' Nr. 10, 71.

¹⁵ Mastermann, in Dobell's 'Reports,' 1870, 382.

¹⁶ Mantegazza, 'Lettere med. sulla America meridionale,' Milano, 1860, i, 19, 100, 115.

¹⁷ Gayraud et Domec, 'Montpellier médicale,' 1878, Juill., 17.

¹⁸ Smith, 'Edinb. Med. and Surg. Journ.,' 1841, Oct., 399, April, 364; Tschudi, 'Oester. med. Wochenschr.,' 1846, 469, 663, 729; Duploux, 'Arch. de méd. nav.,' 1864, Sptbr., 189.

¹⁹ Lafargue, 'Bull. de l'Acad. de méd.,' xvii, 189; Duploux, l. c., 1864, Août, 107.

§ 264. GEOGRAPHICAL DISTRIBUTION OF RHEUMATIC FEVER.

It hardly needs to be said that, in this sketch of the geographical distribution of rheumatism, the various countries of the globe have been spoken of merely in general terms; and that there are more or less considerable differences in the amount of rheumatism noticeable between the several smaller divisions of each, differences that depend in part on climate, and in part on the manner of living. My survey has done no more than show that rheumatism is an *ubiquitous disease*, in the strictest meaning of the term. But, as regards the signification of "rheumatism" in the foregoing sketch, it includes in the first place everything in the published reports that is explicitly named "chronic articular rheumatism," or "muscular rheumatism." Further, it includes also whatever the authorities which I have consulted have designated as "rheumatism" in a general way; so that, as regards that part of the record, the question arises whether only chronic articular and muscular rheumatism are meant, or whether rheumatic fever is not included with them. It therefore remains for me to put together all that can be learned from special references as to the geographical area of the latter disease by itself.

Rheumatic Fever.

The statement made by Fuller and others, that acute rheumatism is almost a stranger to arctic countries, finds no confirmation in the writings on their medical topography. In *Kamschatka*, as we learn from Bogorodsky, rheumatic fever is frequent; in *Iceland* Finsen (l. c., p. 141) saw twenty cases during ten years in a district with a population of 10,000; in the *Farøe Islands* Panum had several cases during a comparatively short residence; and Lange cannot say that it does not occur in *Greenland*. From the northern and temperate latitudes of the Eastern Hemisphere, we have a very large number of records of cases; but it is obvious

that no conclusions as to the relative frequency of the malady can be drawn from these, and there are but few data bearing specially on the question. So far as the latter go, they are for the most part the statistics of hospitals, which are in several respects unsuitable for our purpose. Having stated these reservations, I give the following table compiled from hospital returns, showing the proportion of rheumatic fever cases in every 100 admissions of all kinds:

Percentages of Hospital Admissions for Rheumatic Fever.

Place.	Years observed.	Per 100 of all admissions.
Christiania (Reichshospital) ¹	7	3.5
Copenhagen (Frederikshospital) ²	24	4.0
Rostock (Town's Hospital) ³	2	3.3
Bremen ⁴	12	2.0
Hamburg (General Hospital) ⁵	3	4.5
Dresden ⁶	13	4.5
Giessen (Clinical Institute) ⁷	—	5.0
Würzburg (Julius-Spital) ⁸	4	1.5
Stuttgart (Katharinen-Hospital) ⁹	24	4.5
Zürich (Town's Hospital) ¹⁰	—	4.5

We have also accounts of rheumatic fever being "common" or "very common" in various parts of *Russia* (at Tomsk in Siberia¹¹ and at Tula in the Caucasus¹²), in the northern provinces of *Sweden* (especially Westerbotten), on the *Bavarian* plateau (where it has a foremost place among acute

¹ From the hospital returns in 'Norsk Mag. for Lægevidensk.'

² Lange, 'Studier over den acute Ledderheumatisme,' Kjöb., 1866, 8.

³ Fiedler, 'Arch. der Hlkde.,' 1866, vii, 157.

⁴ Barkhausen, in Häser's 'Arch. für die ges. Med.,' 1841, i, 332.

⁵ Tügel, 'Klin. Mittheil.'

⁶ Fiedler, l. c.

⁷ Vogel, in Virchow's 'Hdb. der spec. Pathol.,' i, 481.

⁸ Roth, 'Würzb. med. Ztschr.,' 1863.

⁹ From the reports in the 'Mittheil. des Württh. ärztl. Vereins,' 1834, 114, 340 and in 'Württhg. ärztl. Correspondenzbl.,' Jahrg. iii, u. ff.

¹⁰ Lebert, 'Handb. der pract. Med. Tübing.,' 1859, ii, 853.

¹¹ Koch, 'Med. Ztg. Russl.,' 1857, 3.

¹² Liebau, 'Petersb. med. Ztg.,' 1866, xi, 281.

diseases as regards the number of cases¹), in certain mountainous parts of the *Canton Vaud* (where there is more of it than in other Swiss cantons²), and in the Upper *Engadine*;³ also in some parts of *Italy* (Turin, Genoa, Alessandria, Mantua), in which country as a whole rheumatic fever counts among the more ordinary diseases,⁴ and in *Sicily*⁵; as well as in *Turkey*,⁶ some parts of Greece (the districts where it is very seldom seen being Sparta and the marshy situations of Nauplia and Livadia⁷) and in *England*.

In Constantinople, according to Rigler, it is unusually common and pernicious, being complicated with inflammation of the endocardium, pericardium, and other serous membranes. With reference to its frequency in London, Macleod⁸ says: "Rheumatic fever is a disease exceedingly prevalent among the class of persons admitted into the hospitals of this metropolis; indeed, so true is this, that I am satisfied all medical men connected with those institutions will bear me out in the assertion that, if we take into consideration the ulterior effects of acute rheumatism, it is not only one of the most prevalent, but one of the most fatal maladies incident to our precarious climate." Ormerod⁹ confirms this with the statement that the number of patients treated for it in the hospitals of London reaches the enormous figure of 11·5 per cent. of all the admissions. As a rule, it is commoner in the central and northern counties than in the southern, as would appear from the notices about it in Stourport,¹⁰ Bristol,¹¹ Manchester,¹² and other places. Writing of Cornwall, Forbes¹³ says: "The whole cases seen by me in four years and a half were four in number, viz. two in 1817 and two in 1821, not one case having been met with in the three intermediate years. In the dispensary report for 1821 I stated: during the whole of the last two years, not one case of acute rheumatism has been entered in the books, and I cannot help thinking that the total absence of the disease

¹ Ziemssen, 'Annal. der Städt. allgem. Krankenhäuser zu München, 1878, i.

² de la Harpe, 'Schweiz. Ztschr. für Med.,' 1849, 157.

³ Ludwig.

⁴ Parola, 'Saggio di climatologia et di geogr. nosol. dell' Italia,' Torino, 1881, 489, 741.

⁵ Irvine.

⁶ Rigler, Sandwith.

⁷ Stephanos, Valassopoulos, 'Congrès des méd. Grècs à Athènes,' 1882, Const. 1883, 23.

⁸ 'Lond. Med. Gaz.,' 1837, Oct., 120.

⁹ 'Med. Times and Gaz.,' 1852, 523.

¹⁰ Watson, 'Transact. of the Prov. Med. Assoc.,' 1834, ii, 196.

¹¹ Symonds.

¹² Lyon; Ransome, 'Brit. Med. Journ.,' 1870, Decbr., 597.

¹³ 'Transact. of the Prov. Med. Assoc.,' 1836, iv, 174.

among so large a body of individuals, for so long a period, is a circumstance that would be reckoned very singular in the northern or even central parts of our island." And the same immunity is reported of Devonshire by Jefferey¹ and Shapter, and of the Isle of Wight and Guernsey by Hoskins,² although chronic rheumatism is very common among the seafaring class.

Coming to the nearer countries of Asia, I do not find any accounts of rheumatic fever except for *Arabia*,³ where it is said to be common in the interior, but seldom seen on the east and west coasts. With respect to *India*, the statements are very conflicting. While some authorities, both old and recent, such as Malcolmson and McGregor, speak of it as rare, and others, such as Shanks, Macpherson, Morehead, Gordon, Day and Curran, conclude from their own experience that it is almost confined to Europeans, and is a good deal milder in type than in Europe, the heart-affection in particular being seen only now and then; Parry,⁴ on the other hand, says, with reference to his experience at Bellary: "I am apt to believe that organic lesion of the heart originating in this way [from acute rheumatism] is both a much more prevalent disease and a more frequent source of inefficiency among our troops in India than is generally supposed;" and a similar opinion has been given by Wallace, Evans, Geddes, Winchester, Huillet and others. But perhaps the most decisive statement is that of Webb,⁵ who remarks in connexion with the numerous preparations of pericarditis and endocarditis in the pathological museum of the Calcutta Medical College: "Nor can we wonder at this; for what disease in India is more universally diffused over the country than articular rheumatism, and what sequence more common to it than endocarditis and pericarditis?" And he adds in a note: "I have seen this in all three Presidencies."

In *Cochin China* rheumatic fever complicated with heart affection is often seen among the native Anamese.⁶ It occurs also in the *Malay Archipelago*,⁷ particularly among the men

¹ *Ib.*, 1843, xi, 226.

² 'Lond. Journ. of Med.', 1852, Aug.

³ Palgrave, l. c.; Guex, 'Gaz. des hôpit.', 1873, 501.

⁴ 'Madras Quart. Med. Journ.', 1842, April, 143.

⁵ 'Pathologia Indica,' Lond., 1848, p. 77.

⁶ Breton.

⁷ Heymann; van Leent, l. c., 1867.

of the Dutch navy;¹ and there have been cases in China among the British troops.² At Tokio (*Japan*) Scheube³ saw only 39 cases in four years (7 of these in hospital) and 4 with heart complication; Wernich⁴ also gives the disease as of rare occurrence in that country, and of a milder type than in Europe. We have information from the Pacific of acute articular rheumatism being rather common (and not unfrequently complicated with heart disease) among the Kanakas in *New Caledonia*.⁵ On the other hand it would seem to be rare in the Marquesas⁶ and Samoa.⁷ Madagascar⁸ and Zanzibar⁹ are reported, somewhat doubtfully, to enjoy an almost complete immunity from rheumatic fever; Borijs, however, has seen a number of cases of it on the small island of *St. Marie*. One of its worst seats on African soil is the *Cape*,¹⁰ according to the experience of every authority. It has been seen comparatively often in the *Cape Verde Islands*,¹¹ in *Tunis*,¹² *Nubia*¹³ and on the *Abyssinian*¹⁴ plateau; in *Egypt*, too, it seems to be rather common.¹⁵ On the other hand, in the Gaboon country,¹⁶ on the Gold Coast¹⁷ and other sections of the West Coast of Africa, as well as in Senegambia¹⁸ and Algiers,¹⁹ it is decidedly rarer and of milder character than in higher latitudes.

Of the area and frequency of rheumatic fever in *North America* we are unable to judge, owing to the extreme scantiness of our geographical information; but, if we may infer from the number of communications made about it to medical societies, particularly in the Northern and Central United States, it should be as common on the whole as in the temperate latitudes of the Old World. In *Mexico*, on the

¹ Pop.² Macpherson.³ In Virchow's 'Archiv,' 1885, Bd. 99, 377.⁴ L. c., 197.⁵ Account in 'Arch. de méd. nav.,' 1866, Janv., 19; Charlopin; Boyer.⁶ Clavel.⁷ Turner, 'Dubl. Journ.,' l. c.⁸ Borchgrevink, 'Norsk. Mag. for Laegevidensk.,' 1872, iii, Raekke ii, 232.⁹ Christie, 'Brit. Med. Journ.,' 1872, June (did not see a single case of rheumatic fever in five years).¹⁰ Schwarz; Fritsch; Egan.¹¹ Hopffer.¹² Ferrini; Friocourt.¹³ Hartmann.¹⁴ Courbon.¹⁵ Pruner; Mayer, Pissas, 'Congrès des médecins Grecs à Athènes,' 1882, Constantinople, 1823, 21.¹⁶ Bestion.¹⁷ Moriarty.¹⁸ Chassaniol; Thaly.¹⁹ Deleau; Armand.

Anahuac (plateau), it figures prominently in the statistics of acute disease;¹ at the same time it appears to be rare on the coast: at all events Heinemann states that he saw no cases of it during several years' practice in Vera Cruz. The same immunity holds for Guatemala² (perhaps for other regions of Central America as well), for Jamaica,³ Barbadoes,⁴ Martinique,⁵ Guadeloupe,⁶ and others of the West Indies, and probably for Guiana. On the other hand, rheumatic fever is truly endemic in the *River Plate States*;⁷ and it is often seen also in *Chili*⁸ and *Peru*.⁹

§ 265. A CHILL-DISORDER IN ALL CLIMATES.

In the views held of the causation of rheumatism (using the word in its widest sense), chill has at all times had a leading part assigned to it. Some have not hesitated to describe the chronic and acute forms as both alike "chill-disorders" *par excellence*, discovering the link between them in the common exciting cause. From the point of view of their origin, the two diseases would be regarded as modifications of one and the same morbid process; and the *a priori* expectation would be, that whenever *circumstances of climate* materially favoured chill-disorders, as in the arctic and temperate zones, that morbid process would be much more general than under the opposite conditions, that is to say, than in subtropical and equatorial latitudes. That such an assumption would be wrong so far as concerns chronic articular and muscular rheumatism, will be seen from the foregoing sketch of the geographical distribution; and in the Army Medical Reports of Great Britain we possess valuable statistical materials for combatting that opinion. The following table shows the annual admissions per 1000 men for "rheumatism,"¹⁰ most of the observations being for the twenty-five years from 1859 to 1883:

¹ Jourdanet.

² Bernoulli.

³ Lemprière, i, 50.

⁴ Jackson.

⁵ Ruff.

⁶ Carpentin.

⁷ Mantegazza, l. c., i, 100.

⁸ Lafargue.

⁹ Tschudi; Smith.

¹⁰ In the statistical tables of the 'Army Medical Reports,' acute articular rheumatism is included under the same head as chronic articular and muscular rheumatism. The statistics may be used, however, for estimating the frequency

Annual Cases of Rheumatism among British Troops at Home and Abroad.

Locality.	Per 1000 men.	Locality.	Per 1000 men.
Nova Scotia and New Brunswick	26.0	Great Britain and Ireland	43.1
Bermuda	29.1	Gibraltar	43.8
Mauritius	30.4	Madras Presidency	44.9
Cyprus	32.2	Bombay „	46.0
New Zealand	34.2	Malta	46.3
Canada	35.8	Australia	49.5
Ceylon	36.2	Bengal	55.2
West Indies (English regiments)	38.4	West Indies (black troops)	62.5
Cape and St. Helena	41.2	West Coast of Africa (black troops)	74.2

According to this, the number of cases is on the whole greater in the warmer than in the colder latitudes. The very large ratios for the black troops in the West Indies and on the West Coast of Africa are to be explained in part by the comparative smallness of the force, which stands at a few hundreds from year to year, and in part by the peculiar conditions of living in the negro race.

The relationship between *climatic conditions* and the number of cases, is a different one in the case of *rheumatic fever*. While tropical and subtropical countries have no absolute immunity from it, and some of them, indeed, such as Central Arabia, India, the Cape, the Abyssinian plateau and Peru, are much subject to it; yet the maximum of frequency falls quite decidedly within the higher latitudes.

of the latter forms, inasmuch as these are infinitely more common than rheumatic fever. It is obvious that these statistics give us no clue to the total amount of the disease in each of the localities to which they relate. It is practically only males of a certain age that they are concerned with (soldiers' wives and children do not affect the question), and these, too, living under special conditions. But that makes the figures all the more trustworthy for comparing the frequency of the disease at the several points on the globe. There are the further recommendations that the statistics are for the most part of large numbers, that a uniform mode of reading the facts observed pervades registration of each individual case has been made in conditions.

§ 266. PREVALENCE OF "RHEUMATISM" AS A WHOLE IN THE
SEVERAL SEASONS.

Considering, then, that those parts of the world with a climate characterised by a good deal of uniformity in the degrees of heat and amount of atmospheric moisture have at least as much of chronic articular and muscular rheumatism as other regions with a climate subject to frequent and extreme changes, and in some instances even more of it, it is not by any means proved by the observations at our service that there is any absolute relation between *season or weather* and the frequency of these diseases. No doubt, in temperate latitudes, most of the cases are seen in spring and autumn, a smaller number in winter, and fewest of all in summer; but those seasonal differences are inconsiderable. For some places in warmer latitudes, such as Tunis,¹ China² and Japan,³ the winter is stated to be the worst season; for others, such as many parts of India,⁴ Algiers⁵ and Senegambia, it is the hot season. Again, there are observers, such as Heymann for the East Indies and Day for Cochin, who deny all connexion whatsoever, as regards pathogenesis, between the amount of the disease and the climatic conditions. In forming an opinion on the question, let us again resort to statistical averages.

The following figures are taken from the 'Statistical Report on the Sickness and Mortality in the U.S. Army;'⁶ they relate to the years 1839-54, and include both chronic and acute rheumatism. The average admissions per 1000 men were 28.9 in the three months January to March, 31.4 from April to June, 25.4 from July to September, and 28.3 from October to December; so that, if the spring prevalence be taken as 1, winter would be 0.92, autumn 0.90, and summer 0.81.

Of 824 cases in India, which Gordon has collected, 209 (or 25.2 per cent.) occurred from January to March, 199 (24.2 per cent.) from April to June, 195 (23.6 per cent.) from July to September, and 221 (27 per cent.) from October to December.

At the Cochin Dispensary, according to Day, 1500 patients were treated for rheumatism in ten years, their distribution according to

¹ Friedmann.

² Friedel.
⁴ on.

³ Godet.

⁵ Deleau.

seasons being as follows: January to March 331 or 22·1 per cent.; April to June 345, or 23 per cent.; July to September 387, or 25·8 per cent.; and October to December 437, or 29·1 per cent.

All these facts do not weaken the force of every-day experience, that abrupt changes of temperature, implying the somewhat sudden cooling of the heated body, or its exposure to strong currents of cold air or to draughts, have an influence in producing chronic articular and muscular rheumatism. And that ordinary experience is in fact borne out by observations made in various hot countries (India¹, Cochin China,² Kabylia,³ South Africa,⁴ and the West Coast of Africa⁵), which show that rheumatism is most apt to attack those who had spent the night in the open air on wet ground, even if it had been in the hot season. Facts such as these serve to prove that the pathogenesis is an affair of chilling influences, which prevail equally all over the world, and are most active in equatorial and many subtropical countries where the slightest fluctuations of the thermometer are very sensibly felt, owing to the heat being always great. We see also that the very considerable differences in geographical distribution between this chill-disorder and the catarrhal maladies that are also referable to chill, particularly those of the respiratory organs, must correspond to certain differences in the etiology.

§ 267. INCIDENCE OF RHEUMATIC FEVER ACCORDING TO SEASON.

Concerning the relation of rheumatic fever to influences of the season, we have a number of statistical facts. Although these have only a limited value, being taken exclusively from hospital or dispensary practice, there is no other material that can be used; and I have put together a table of them for a number of towns in Germany and Switzerland, which are somewhat uniformly placed as regards climate.

¹ Houston.

² Riehaud.

³ Challan.

⁴ Fritsch.

⁵ Clarke.

Rheumatic Fever according to Months and Seasons.

Period.	No. of cases.	December.	January.	February.	Winter.	March.	April.	May.	Spring.	June.	July.	August.	Summer.	September.	October.	November.	Autumn.
Copenhagen ¹	1850-1865 2894	9.9	10.9	9.4	30.2	8.3	9.2	9.9	27.4	8.1	7.3	7.8	23.2	4.3	6.8	8.3	19.4
Berlin ²	1875-1881 127	11.2	6.3	8.7	26.2	9.4	6.3	11.8	27.5	8.7	11.0	6.3	26.0	9.4	7.9	3.1	20.4
Leipzig ³	1851-1856 89	11.2	14.5	6.7	32.5	9.0	10.1	6.7	25.8	6.7	2.3	6.8	15.8	9.0	7.9	9.0	25.9
Dresden ⁴	1850-1862 651	11.4	9.8	8.1	29.3	9.2	7.8	10.6	27.0	9.9	5.5	5.5	20.9	5.6	7.3	10.0	22.9
Bonn ⁵	1875-1879 61	8.2	18.0	4.9	31.1	14.8	6.6	8.2	29.6	4.9	6.6	4.9	16.4	11.5	4.9	6.6	23.0
Frankfurt-o.-M. ⁶	1857-1866 692	—	—	—	31.2	6.3	15.1	15.1	26.9	—	—	—	18.9	—	—	—	23.0
Würzburg ⁷	1857-1860 70	8.8	3.7	8.8	21.3	6.3	15.1	15.1	36.5	6.3	3.7	6.3	16.3	6.3	12.6	6.3	25.2
Munich ⁸	1865-1875 1821	—	—	—	26.2	—	—	—	27.9	—	—	—	26.6	—	—	—	19.3
Zürich ⁹	1853-1858 230	6.9	9.5	8.7	25.1	9.2	13.2	9.2	31.7	9.3	6.9	5.6	22.1	7.7	5.9	7.8	21.4
" ¹⁰	p 274	—	—	—	30.6	—	—	—	41.2	—	—	—	16.1	—	—	—	12.7

¹ Lange (Frederika Hospital).² Pulvermacher, 'Ein Beitr. zur Statist. der Pneumonie und des Gelenkrheumatismus in Berlin,' Diss. Berl., 1882 (Polyclinic of the Augusta Hospital).³ Wunderlich, 'Handb. der spec. Pathol. und Therapie,' 2te Aufl. iv, 612 (hospital cases).⁴ Fiedler, l. c. (cases in the city hospital).⁵ Eschbaum, 'Beitr. zur Statist. einiger acut-entz. und Infectiöskr.,' Bonn, 1880.⁶ Varrentrapp, l. c. (cases in the Heiligen Geist Hospital).⁷ Roth, l. c. (Julius Hospital).⁸ Ziemssen, l. c. (hospital cases).⁹ Lebert, 'Klinik des acuten Gelenkrheumatismus,' Erlang., 1869, 107 (hospital cases).¹⁰ Müller, l. c. (hospital cases).

At nearly all the places in this table, the largest number of cases is in spring and winter, the smallest in autumn and summer: the actual ratios for the seasons in the above order being 30·1, 28·3, 21·3, and 20·2. The pathogenic influence of the sort of *weather* proper to the colder seasons comes out here beyond question; and it is not less definitely indicated in the prevalence of rheumatic fever in colder latitudes as contrasted with its comparative rarity in equatorial and sub-tropical countries. But we shall have to assign to that factor the significance merely of a predisposing cause, for the reason that rheumatic fever has occurred under the opposite conditions of warmth and dry weather, not only in exceedingly numerous single cases, but over and over again even in small epidemics.

§ 268 INFLUENCE OF LOCALITY.

In the etiology of rheumatism, we have to take into account peculiarities of the *soil*, such as elevation, configuration, the kind of rock and the physical characters, only in so far as these may affect the climate of the locality. It is in that sense that we have to interpret the well-known preference of the disease for open basins and plateaus exposed to the wind, for damp and deeply cleft valleys, and for sea coasts or the shores of great rivers. There are unfortunately no statistical materials for instituting a comparison of the disease on the different kinds of soil. In Balfour's account of rheumatism among British and native troops quartered at various elevations in the Madras Presidency, we get the following average admissions per 1000 men, bringing out only slight differences:

	Coast stations.	Stations on the plains.	Elevated stations.
English troops	174	113	126
Native	57	58	52

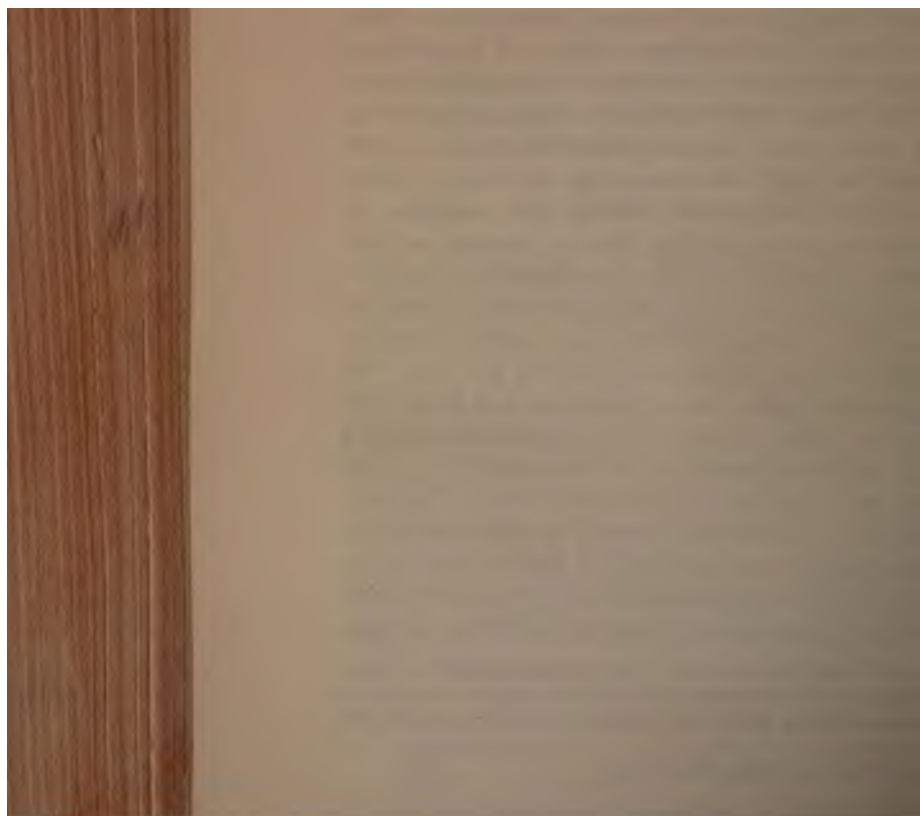
We need not be surprised that some malaria-crazed writers have traced a connexion between this disease, particularly the febrile form of it, and the direct influence of wet or marshy soil. The evidence adduced in that theory rests on a few casual which have been interpreted after a

§ 269. RHEUMATIC FEVER AS A SPECIFIC INFECTION.

The considerable differences, in the circumstances of their origin, between rheumatic fever and chronic articular or muscular rheumatism were recognised and commented on by several of the older writers. When I was working at the facts of geographical distribution, for the first edition of this work, a sense of these differences forced itself upon me still more strongly. There was the very unequal distribution of the two forms over the globe; the lesser degree of dependence on meteorological influences in the case of rheumatic fever; and, most of all, the very remarkable fluctuations in the amount of the latter at the several points where it has been watched, so much so that it has seemed at one time to retire altogether into the background among the maladies of ordinary occurrence, and at another time to assume an epidemic character.¹ These were the considerations that led me at that time to throw out the conjecture—and I was the first to do so—that rheumatic fever is a *specific infective disease*. More than ten years passed before the idea was taken up, the parasitologists having been the first to bring it into notice again. And although the rheumatism-fungus discovered by Salisbury² remains for the present a hypothetical factor, and it is still a question whether the principle of "infection" is necessarily bound up with parasitism; yet the idea started by me has found a firmer basis in the most recent experience, and rheumatic fever would now seem to have an assured place among the acute infective diseases.

¹ The statement of Pissas, that rheumatic fever is epidemic from time to time in Egypt, serves to show that the remark in the text holds good, not only for the countries in temperate latitudes where the disease is at its worst, but for the warmer countries as well.

² 'Amer. Journ. of Med. Sc.,' 1867, Oct., p. 359.



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1. The first step in the process is to identify the problem or issue that needs to be addressed. This involves gathering information and understanding the context of the problem.

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1. The first step in the process is to identify the problem or issue that needs to be addressed. This involves gathering information and understanding the context of the problem.

2. Once the problem is identified, the next step is to define the objectives and goals of the project. This helps to clarify what needs to be achieved and provides a clear direction for the team.

3. The third step is to develop a plan or strategy to address the problem. This involves breaking down the problem into smaller, manageable tasks and determining the resources needed to complete each task.

4. The fourth step is to implement the plan. This involves putting the strategy into action and monitoring progress regularly to ensure that the project is on track.

5. The final step is to evaluate the results of the project. This involves assessing the outcomes against the objectives and goals and identifying any areas for improvement.

1. The first step in the process is to identify the problem or issue that needs to be addressed. This involves gathering information and understanding the context of the problem.

1. *Staphylococcus aureus* (ATCC 12228) was grown in Tryptone Soy Broth (TSB) (Difco) at 37°C. Cells were harvested by centrifugation at 5000g for 10 min, washed with distilled water, and resuspended in distilled water. Cells were then lysed by sonication (10 min, 30% duty cycle, 100 W) and centrifuged at 1000g for 10 min. The supernatant was then centrifuged at 10000g for 10 min and the pellet was resuspended in distilled water. The protein concentration was determined by the method of Bradford (1976).

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1. *Chlorophyll a* and *Chlorophyll b* content were determined by spectrophotometry using the method of Lichtenthaler and Sponholz (1980). The total protein content was determined by the method of Lowry (1956).

1. *Chlorophyll a* (Chl *a*) is the primary photosynthetic pigment in most plants and algae. It is a green pigment that absorbs light energy in the blue and red regions of the visible spectrum.

2. *Chlorophyll b* (Chl *b*) is an accessory pigment that absorbs light energy in the blue and red regions of the visible spectrum. It transfers energy to Chl *a* for photosynthesis.

3. *Carotenoids* are accessory pigments that absorb light energy in the blue and green regions of the visible spectrum. They transfer energy to Chl *a* and Chl *b* for photosynthesis.

4. *Xanthophylls* are a type of carotenoid that absorb light energy in the blue and green regions of the visible spectrum. They transfer energy to Chl *a* and Chl *b* for photosynthesis.

5. *Anthocyanins* are water-soluble pigments that absorb light energy in the blue and green regions of the visible spectrum. They are responsible for the red, purple, and blue colors in many plants.

6. *Phycobilins* are water-soluble pigments that absorb light energy in the blue and green regions of the visible spectrum. They are found in cyanobacteria and red algae.

7. *Phycocyanin* is a type of phycobilin that absorbs light energy in the blue and green regions of the visible spectrum. It is responsible for the blue-green color in cyanobacteria.

8. *Alloxanthin* is a type of xanthophyll that absorbs light energy in the blue and green regions of the visible spectrum. It is involved in the xanthophyll cycle, which helps protect the photosynthetic apparatus from damage by excess light.

9. *Zeaxanthin* is a type of xanthophyll that absorbs light energy in the blue and green regions of the visible spectrum. It is involved in the xanthophyll cycle, which helps protect the photosynthetic apparatus from damage by excess light.

10. *Violaxanthin* is a type of xanthophyll that absorbs light energy in the blue and green regions of the visible spectrum. It is involved in the xanthophyll cycle, which helps protect the photosynthetic apparatus from damage by excess light.

[illegible]

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